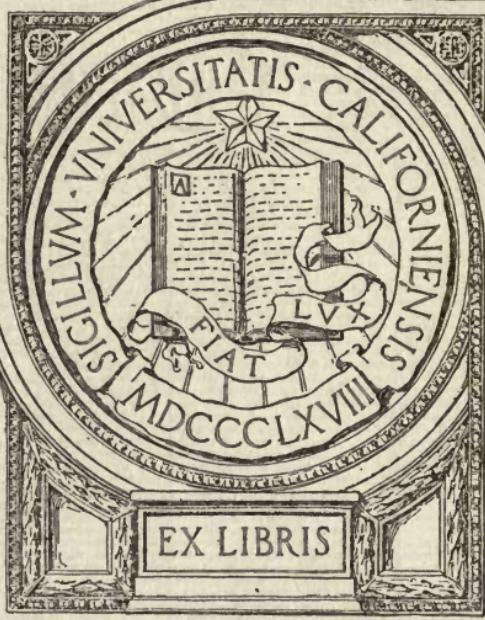
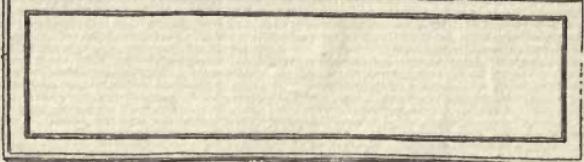
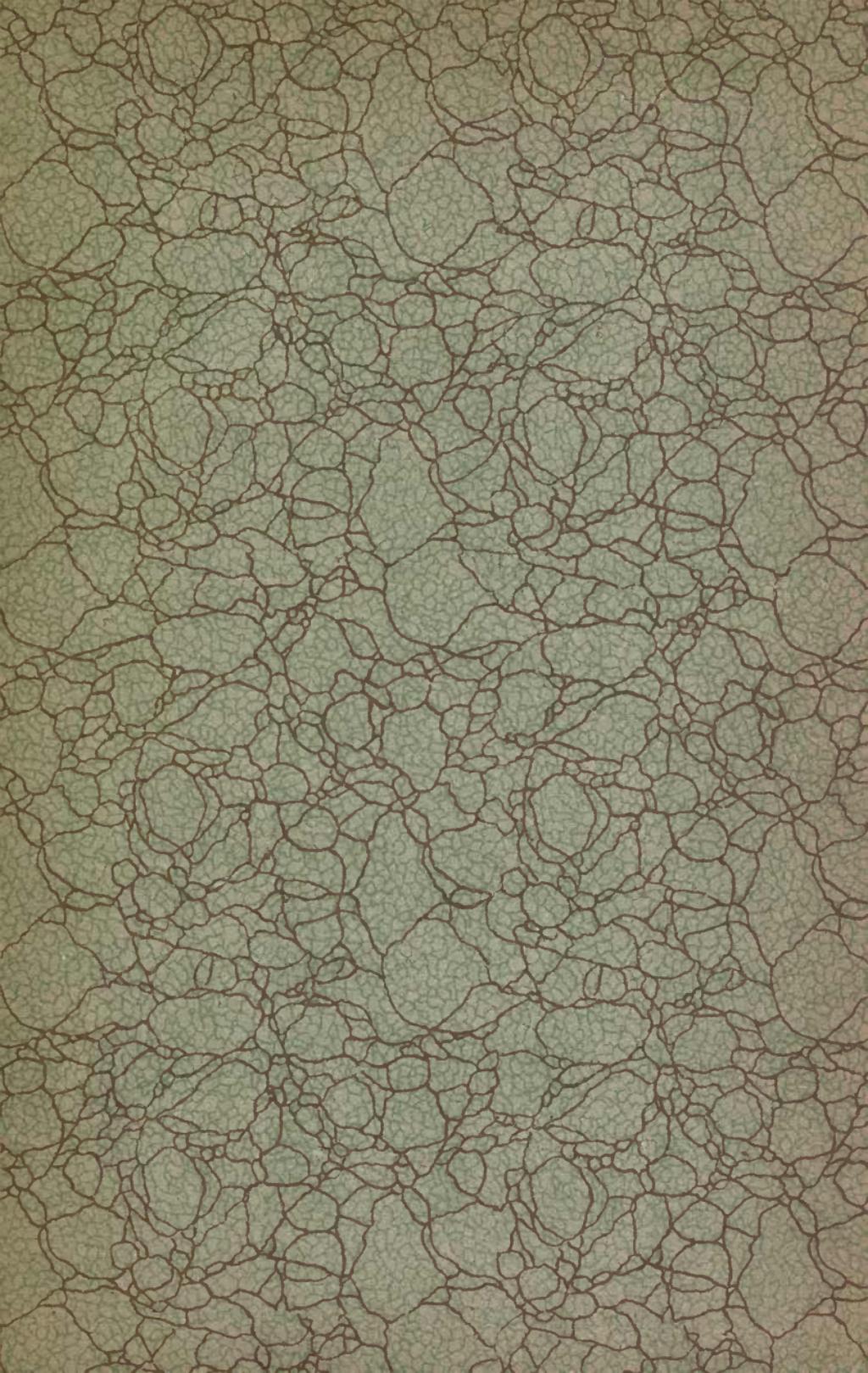


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THE DOMESTIC SHEEP:

ITS CULTURE AND GENERAL MANAGEMENT.

BY HENRY STEWART,

AUTHOR OF

The Shepherd's Manual; The Dairymen's Manual; Irrigation
for the Farm; Garden and Orchard; The
Culture of Farm Crops.

PROFUSELY ILLUSTRATED.

“The Sheep is the most profitablist
animal a man can have.”—FITZHERBERT.

CHICAGO:
AMERICAN SHEEP BREEDER PRESS.
1898.

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P R E F A C E .

Since the publication of the Shepherds' Manual by the present author a vast increase has occurred in the estimation in which the sheep has been held by American farmers, and indeed this great agricultural interest has advanced by strides everywhere all over the civilized world where agriculture has reached its full development. And while the work mentioned is still in print and circulation, and fills a useful place in the special literature of the farm, yet circumstances have occurred which make it desirable that some newer work of wider adaptation to the great interest involved should be undertaken for the information of all concerned in the rearing of sheep and for the encouragement of this part of farm industry.

This present work is therefore offered to shepherds in the hope that it may be found useful and effective in advancing this important interest, and in assisting to more fully develop the breeding and rearing of sheep.

HENRY STEWART.

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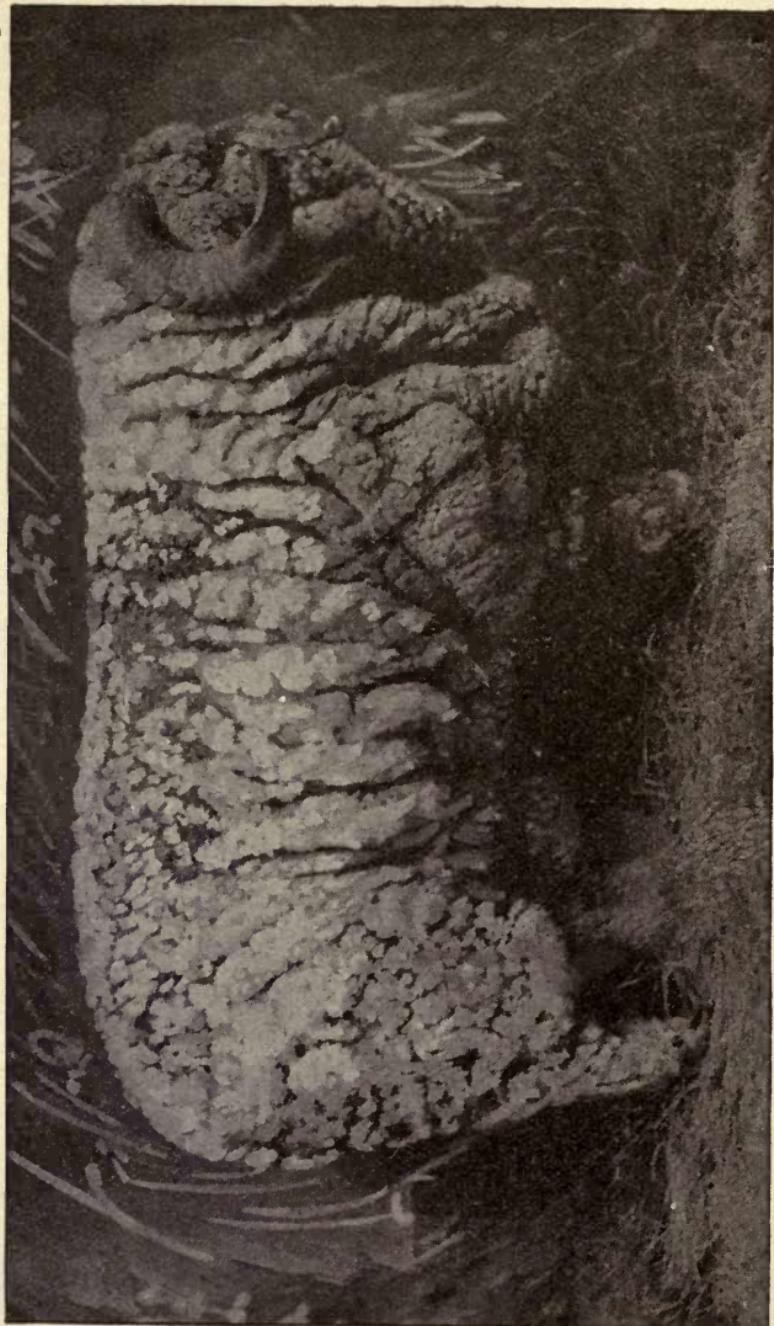
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“BABY LORD.”

Bred by Reynolds & Daved, Kansas. Sheared 52 lbs., 13 mos. growth Heaviest fleece on record.

THE DOMESTIC SHEEP:

ITS CULTURE AND GENERAL MANAGEMENT.

CHAPTER I.

THE NATURAL HISTORY OF THE SHEEP.

It is not only interesting, but exceedingly useful practically, to know as much as possible of the origin and general history of the domestic animals which have—during, we know not how many centuries—been brought under the dominion of mankind, and have gradually been domesticated, changed by this culture, and made subservient to the profit of the farmer and the uncountable advantage of mankind.

There are several different races of the original wild sheep, and as it is certain that some of these original races have become the progenitors of our domestic sheep it is interesting to study the peculiarities of these races, and so learn as much as may be of the true origin of our modern sheep.

This is by no means as ancient as might be supposed. Unlike the horse or the ox whose origin may be traced back through the early ages of the history of the world, long before mankind came into existence, our sheep seems to have been almost co-existent with the first appearance of man, and may quite possibly have been the survival of the domestication, and improvement thereby, of one of the original breeds of the wild sheep.

Of these there are several, but there is no evidence in support of the belief that any one in particular has been so domesticated and changed by special breeding, except in regard to two of the ancient wild races referred to. These are the Argali of Southern and Central Asia, and the Musimon of Southern Europe.

It is quite probable that both of these original races have

an ancient relationship to the sheep, and that the latter is the original parent of our European race, while the races at present existing in Asia have descended from the former. As we have to do with the sheep of Europe, it will be necessary to confine ourselves simply to this European wild sheep, and note its resemblance to the first domesticated breed of modern sheep, the Merino.



MUSMON OF EUROPE.

For the first record of sheep we have is of this fine wooled variety, which was most carefully cultivated by the ancient Romans who made the fine and costly garments, even the imperial robes dyed in the costly Tyrian purple, of the wool of the ancient Merino of Spain, which is the progenitor of the Merino of the present time.

The illustration of the Musmon, given here, will go to show that this belief is well founded and that all our modern breeds have descended from this first parent, which still exists in the islands of Crete and Cyprus, and the mountains of Greece, as well as in Corsica and Sardinia. It formerly abounded in Spain, and it is from these very localities that the ancient inhabitants of Rome procured their choicest fleeces.

It is also on record by some of the ancient Roman writers, and by that ancient naturalist Pliny, that the Musmon was used to cross on the ancient sheep, bred by the Romans for the sake of its fleece, and that the produce of the cross was fertile. But however it may have been, this we know on



ARGALI OF ASIA.

the authority of the most ancient records, that of the history of mankind given in the Scriptures, viz: that while the first man, or we may think the first distinct race of men, were cultivators of the ground, the second were keepers of sheep. In fact the sheep unquestionably was the first domesticated animal, and not so much for its flesh, although we soon find that this was a choice article of food, but for its fleece. In fact we find in the most ancient remains of the earliest human races, that wool was used for clothing, first by the use of the skins of the sheep, and in time that it was spun and woven into cloth. And during all the earliest history of mankind to the present, we find that the sheep has been accounted, at least, an equal part of the wealth of mankind with all other animals or possessions. Moreover we are forced to conclude, as the result of a study of history, that the ancient shepherds who were wanderers, alternately in-

habiting the mountains and the plains, following their flocks wherever they strayed, and taking possession of the best lands they met with by force of their numbers and good fighting qualities, derived doubtless from their early youthful combats with the savage beasts of prey from whose attacks they successfully protected their flocks. And the Merino has been, and still is, from that long bygone time, a wandering sheep; thriving by change of pasture, if only from one small field to another; for this change, slight as it is, seems to satisfy its desire for fresh fields and pastures new.

At that early age the flock supplied the owners with food and raiment, and nothing more was wanted to fully fill all the needs of the early races of mankind. Thus the first men became shepherds, by the mere force of circumstances; and it is interesting to note that our own shepherds of the West are following in the footsteps of the ancient patriarchs, and still perpetuating the habits and industries of the earliest people of the human race. And if this is so it seems to be an unavoidable result of the necessary relation of the sheep to the human race, that the flock, under whatever conditions both may exist, must always be a profitable possession of mankind, in spite of all the mistakes made by politicians and political economists, and under whatever changes in our civilization may occur in the dim future. And that old saying of one of the oldest writers on practical farm economy, quoted at the title page, will remain true, as an encouragement for the shepherd, as long as the human race may survive.

While it might be interesting to follow out this subject of the natural history of the sheep, and give some account of the many varieties now existing, we propose to confine this work to its practical purpose entirely, leaving those who may feel interested beyond this limit to study the subject in the works of the special naturalists.

But it is worthy of note to the intelligent shepherd, as closely related to his industry and the improvement of his flocks, that all the different breeds of sheep now existing must have sprung from this single source, and have been produced by the art of the breeders who have given their attention to the improvement of the natural flock. This im-

provement, however, is by no means a modern thing. It was in full progress at the time of the patriarch Jacob, who by a trick, as it may be termed, worthy of the most experienced breeder of modern times, got from his father-in-law the best of the lambs for his share of the flocks which he tended under a sort of contract, quite common now-a-days, that is, for a share of the produce. How long before that ancient time the modern rules of breeding were then in practice we have no means of knowing, but it may be well believed that this art of improvement had been long in vogue, and was the basis of the high condition of the flocks at that time.

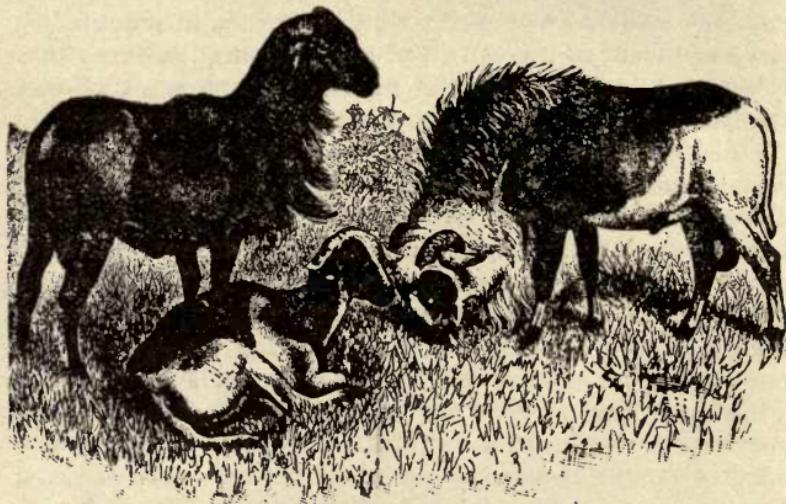
The high condition of intelligence among the leaders of society even in the days of Moses, and the consideration given to the flocks as property, together with the large numbers of sheep owned by noted individuals as a mere matter of course, all goes to show that the art of the shepherd was even in those early times very highly cultivated and most highly considered. In fact, as the sheep was one of the most important sources of wealth, we may be sure the flocks were cultivated as carefully as the high degree of intelligence then would lead us to think. And this common knowledge of course became a matter of history, repeated and handed down by the ancient writers for even our information.

And the arts of improving sheep by the best breeding, as then practiced, may be taken as a guide for us at this time. Here is what Virgil—that accomplished Roman farmer and breeder—says in the third book of his Georgies: “There will be always those in every flock whose forms you will wish to change, therefore always repair them, and choose out from the flock the best offspring yearly. Then after the birth, the care is transferred to the lambs, and they brand them with the marks and the names of the race, which they may wish to keep for breed for preserving the flock. And if wool be your care, select white flocks, with soft fleeces. And if, although the ram himself be white, reject him which has a black tongue under his moist palate; lest he may stain the fleeces of the lambs with black spots, and look about for another in the full field.”

Nor were the ancient shepherds at all behind the most enthusiastic of the modern ones in paying enormous

prices for the desired animals chosen for the improvement of their sheep. For a shepherd of the time of the Roman Caesar Tiberius is recorded as giving a sum equivalent to five hundred dollars for a ram of a noted breed, chosen from one of the most noted flocks in the world at that time.

And in more modern times we find that the kings and emperors thought a present of a fine ram and a bunch of



AFRICAN SHEEP.

ewes from their high bred flocks, a worthy present to be made or received. It was in this way that some of the first of the Cotswold breed were brought into England as a gift from the Spanish emperor to the English king several centuries ago. Indeed we may thank the kings of England very cordially for their enterprise in cultivating the breeding sheep from the finest, by procuring the specimens from every possible source, and by the strictest laws protecting the native flocks from deterioration.

Moreover we may take a hint and lesson from this period of the history of the British sheep. For not only were the sheep protected in the strictest manner, but so was the trade in wool. Every art of the economist was invoked for the protection of the woolen manufacture in England. It was a felony, punishable by death, to export a sheep, and the introduction of foreign woolen goods was entirely forbidden. At the same time every skilled artisan who was

expert in manufacturing woolen goods found a cordial welcome in England. In addition to the severest and most strictly enforced laws for the protection of the wool product and manufacture, the immigration of foreign experts in the woolen manufacture was encouraged until at last, after centuries of such protective culture, England monopolized the woolen manufacturing business of the world. It is one of the sad examples of unwise liberality on the part of some of our statesmen that these lessons, taken from such a conspicuous example of history, should be disregarded and—as most truly said by the ancient writer quoted on the title page—"the most profitable animal a man can have" should be sacrificed to the mistaken policy of admitting free of import duty the products of countries whose trade has been built up and brought to a full growth by the most severely protective laws known in the history of the world. Surely it would seem that we should follow this most striking example of the building up of trade to a condition of self-support by centuries of favorable legislative protection. This is a matter the American shepherd should study well for his guidance.

THE ANATOMY OF THE SHEEP.

None of our domestic animals can be managed successfully without an accurate knowledge of its anatomy, and of the special functions of its parts. The anatomy or physical structure of any animal controls its constitution, that is to say, its subjection to good or evil results in its living and general management; for while this word in its full sense means the formation and general disposition of any organized thing, in the common sense, as applied to animals, it means as well the principles or general laws by which its successful existence is secured; its susceptibility to good or evil, by the conditions of its existence or management; its ability to resist misfortunes, and its prosperity under the skillful management of its intelligent keeper. The constitution of the domestic sheep in this regard is especially one to be well studied by the shepherd, for the due preservation against these accidents and common occurrences by which it suffers in a greater degree than any other of our domestic animals.

The sheep belongs to that large family of quadrupeds

known as the Ruminantia, for the reason that they are all ruminating animals, having four stomachs, cloven hoofs, and incisors only on the lower jaw, the teeth in the upper jaw being wanting, and replaced by a hard, tough pad against which the lower teeth impinge when the animal is pasturing, thus severing the herbage.

Its family is known as *Ovis*, and is peculiar on account of having no tear pits, but instead a number of small follicles or bags from which is secreted an oily matter by which the movements of the eye in its socket and also of the eyelids are facilitated.

The organs of nutrition are the most important part of the structure of this animal. They consist first of:

The mouth and teeth. The mouth extends from the lips to the gullet, which is the entrance to the alimentary canal. The sheep, like the ox, has a set of deciduous or milk teeth, which in course of time are shed and replaced by a new and permanent set. It has no canine teeth, otherwise known as dog teeth. There is a considerable space of the jaw that is destitute of teeth, that is, between the front or incisor teeth and the molars or grinders. There are thirty-two teeth in all, the same number as in the ox tribe. In the lower jaw there are eight incisors or cutting teeth. It is curious that this is the precise number existing in mankind, but the whole number is placed on the lower jaw of the sheep, and in man they are divided between the upper and lower jaws. The sheep has twenty-four grinders or back teeth, which is four more than mankind possess; but the whole number of teeth in the sheep is the same as in man.

The number and condition of the sheep's teeth are an easy indication of its age. There are twenty deciduous teeth, the first of which appear before or soon after birth. These consist of the two central incisors, and three of the molars or double teeth. The whole of the incisors appear at the age of two or three weeks. The first molars appear before or soon after birth, three on each side. The last two incisors, one on each side, appear at six to nine months after birth. This completes the set of front teeth. The complete set of molars do not appear until the sheep is in its fifth year, when the last one appears. The following table will be a guide to the process of dentition.

The figures here given show the appearance of the middle pair of the front teeth at the age of $1\frac{1}{2}$ years, at which age the English courts have decided that the lamb becomes a sheep.

TABLE OF DENTITION OF THE SHEEP.

ERUPTION.	REPLACEMENT.
-----------	--------------

FRONT TEETH OR INCISORS.

Before or soon after birth.....	$1\frac{1}{2}$ years
The same.....	$2\frac{1}{2}$ "
14 days.....	$3\frac{1}{2}$ "
2 to 3 weeks.....	$4\frac{1}{2}$ "

MOLAR OR DOUBLE TEETH.

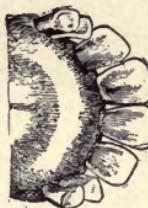
Before or a few days after birth.....	$1\frac{1}{2}$ years
The same.....	$2\frac{1}{2}$ "
The same.....	$3\frac{1}{2}$ "
6 to 9 months.	$2\frac{1}{2}$ years. 4 to 5 years.

After the fifth year a sheep is known as to its age by the full mouth, and as the age increases by the wearing of the teeth. But this is not altogether a sure guide, for a flock pasturing on a poor pasture or sandy soil will so quickly wear down its cutting teeth that they will appear to be so blunt as to indicate a much greater age. This is to be taken into account, and the general appearance, as will be described hereafter, in other respects must all be taken into account. This, however, is not of much account practically, for except it be some favorite and prolific ewe, it is rarely that a sheep is kept so long that its age is any reason for despising it. It is well, however, that the shepherd and especially purchasers of sheep should be able to ascertain the age up to the point of maturity. The author has kept some ewes until the age of thirteen years, having twins every year after the second, and never found any indication of inability to feed as well as a young sheep. What the full age of a

1st year.



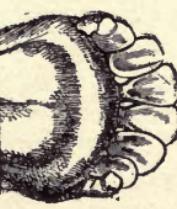
2d year.



3d year.



4th year.



THE TEETH OF THE SHEEP.

sheep may be has never been accurately determined by any authoritative evidence, but it is very probable that if well cared for a sheep may be kept with profit until twenty years old, and the mutton even then may be as tender and good or better than a four year old sheep that has been ill cared for.

The lips of the sheep are so peculiar as to deserve mention. They are extremely mobile, thin, and take an active part in the gathering of the food. The upper lip does not show any muffle, which is the broad patch seen in the ox, and which is furnished with active excretory apparatus, seen at times by the conspicuous drops of perspiration exuded by it in warm weather. This is absent in the sheep, and the upper lip is thin and divided by a fissure so that each half of the lip may be moved independently of the other.

The teeth are really a part of the digestive system as they grind the food along with the secretion of the glands of the mouth, and which are known as the salivary glands. These are placed within the lips, under the tongue, and along the jaws. They secrete a peculiar fluid which has the effect of changing the starch of the food into sugar, as well as aiding in the digestion of it in the stomach. In all the ruminants these glands are large and exude a copious amount of saliva, especially during the act of rumination, by which the food, having been coarsely ground at the first, is macerated in the first stomach and then regurgitated to the mouth where it is further ground at pleasure and then passes on to the second and third stomachs where it is again ground and macerated between the folds of the manyplies, after which it goes to the true digestive stomach, the fourth compartment, and having been digested there it is finally disposed of in the intestines.

THE SHEEP'S STOMACH.

The changes which the food of all the ruminating animals undergoes are mostly all accomplished after it has been swallowed, and has been subjected to the action of the first and second stomachs. After this preparation the food is formed by a peculiar moulding apparatus into long pellets, which are forced back into the mouth and are there subjected to the solvent influence of the saliva, copiously se-

creted by the glands of the mouth. This is the act of rumination. It is during this process that the saliva is mostly secreted, for very little of it is concerned in the first chewing of the food. But the flow of it during mastication in the ruminating process is very copious, and so much so as to form with the finely ground food a mere semi-liquid, thus aiding in the solution of the nutritive matter contained in the food. It has been thought that this curious process has been designed especially for this class of animals, inoffensive, mild and meek and unarmed, and seemingly intended by nature as food for the ravenous, carnivorous, blood-thirsty beasts of prey. It has thus been provided with some means of escaping extermination, by its habits of

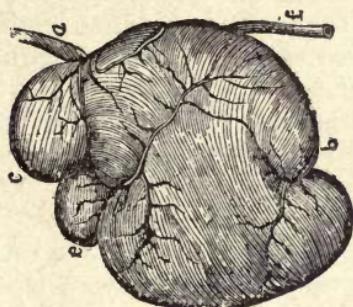


Fig. 1.

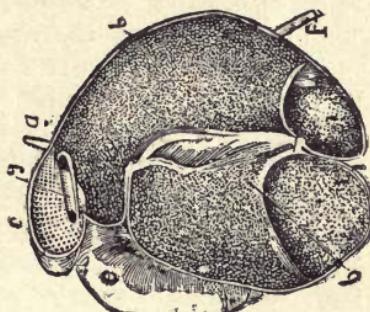


Fig. 2.

THE SHEEP'S STOMACH.

a.-Gullet; b.-Rumen; c.-Reticulum; d.-Omasum; e.-Abomasum; f.-Duodenum. Fig. 2 shows the interior of the stomach.

secretiveness, feeding at night, or at short intervals during the days, in which it is able to swallow its hastily gathered food, and retiring to its coverts there at leisure and in safety completing its process of remastication and performing the needed functions of nutrition.

A correct knowledge of the stomach is therefore not only interesting to the shepherd, but useful in the management of a flock. For it is the case that most of the mishaps and ordinary diseases of the sheep are originated in the digestive processes, which not being duly performed lead to a general disturbance of the system, by which a majority of the ailments of the sheep are caused.

Taking a general view of this organ we find it to be

a capacious sack to which are attached minor compartments lying between it and the duodenum or first part of the bowels, three in number, thus making a quadruple bag, as it were, through the parts of which the food passes, and in each of which a distinct process of digestion is performed. The food passing down the gullet (a) from the mouth, enters the rumen or paunch (b) where it remains for a time until, at leisure, it is forced back to the mouth by a peculiar movement of the gullet. This is composed of rings surrounded by an elastic membrane, and which are very easily dilated to a considerable extent. The gullet, also called the esophagus, passes through the entrance of the rumen where it is connected with the second compartment as well as with the third, by a canal, or gutter, known as the esophageal canal. This connects with the rumen by a slit or opening which is closed except when it is pressed open by the force of the passing food, or by some function of its connective parts. This opening is easily forced, doubtless by the will of the animal, and as the canal is filled with the contents of the rumen it closes, holding a cud or mass of the food; this then is forced to the mouth by a successive contraction of the elastic rings, in precisely the same manner, but in a contrary direction to that by which the food is first swallowed. The cud then being remasticated and diluted copiously with the saliva, is again swallowed; and by reason of its soft and semi-liquid consistency it passes over this opening in the groove and goes into the third compartment, passing the orifice of the second stomach on its way. The second stomach is called the reticulum or honeycomb.

The third stomach is called the omasum, commonly the manyplies, on account of the large number of leaves lining it. These leaves with their attachments to the walls of the omasum are shown at figure 2. The food is ground and macerated between these leaves until it becomes sufficiently disintegrated to be acted upon by the gastric juice of the fourth stomach, known as the abomasum, which is the true digestive organ.

To repeat concisely this function of the stomach, we may say that the rumen is a sac in which the food taken during the short and rapid feeding time is kept in reserve, and whence it is carried back to the mouth for the process of

rumination, after having been more or less softened by the warmth and moisture of the rumen.

The second stomach, the reticulum, participates in the functions of the rumen to which it is mostly a convenient appendage. But it always contains a large quantity of liquid and doubtless plays the part of a reservoir much as in the camel, well known to carry a considerable extra store of water for immediate use as it may be required.

The esophageal canal carries into the third stomach or omasum, past the opening of the reticulum, the matter swallowed after rumination, or even any finely ground or soft semi-liquid food swallowed the first time, and which has not solidity and consistence sufficient to force open the slit or opening in the canal.

The omasum completes the final disintegration of the food by a process of rubbing or trituration between its leaves.

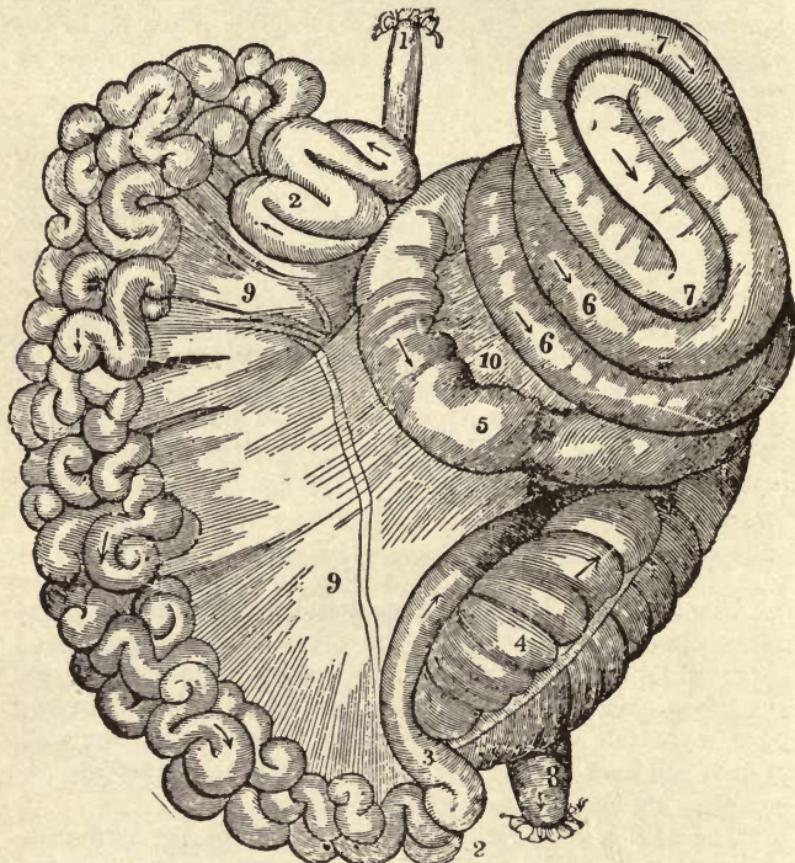
The abomasum is a true stomach, in which the gastric juice is secreted, and which finally dissolves the nutritive substance of the food, and renders it fit for the absorption of it by the villi of the intestines.

THE INTESTINES AND THEIR FUNCTIONS.

The intestines is a long tube doubled upon itself a great many times, through which the digested food passes and gives up its nutritive matter to be absorbed and carried into the blood. The internal coat of this folded tube is covered by a multitude of minute absorbent vessels called the villi. It is a network of blood vessels and so-called lacteals, resembling the close pile of velvet.

The villi absorb the nutritious matter of the now completely digested food and pass it on, as it were, to the great portal vein by which the dissolved aliment of the animal, fitted by complete digestion for the enrichment of the blood, is carried to the heart, and enters the right ventricle, from which it is passed on to the lungs where it is brought into contact with the air breathed by the animal, absorbing oxygen from it, and then becoming perfect blood. The blood then, after this exposure to the oxygen of the air, is forced into the left ventricle, and from this forced by the contraction of the enormously strong muscular action of the

heart through the arteries by which it is poured into the system of capillaries. These pervade every part of the body, internally and externally, and are so closely distributed that no part of the system can be punctured by the



THE INTESTINES AND MESENTERY.

1. The duodenum.
2. The jejunum.
3. The ileum.
4. The cecum, being the anterior prolongation of the colon, or first large intestine. The ileum opens into this (on the back side as presented in the cut), about 12 inches from its extremity, the opening defended by a valve.
5. The large anterior portion of the colon, retaining its size, (about three times that of the smaller intestines) for about two feet.
6. The colon tending toward the center.
7. The returning convolutions of the colon.
8. The rectum or straight gut, communicating with the anus.
9. The mesentery, or that portion of the peritoneum which retains the intestines in their places.
10. The portion of the mesentery supporting the colon, &c.

The united length of these intestines is upward of sixty feet.

finest needle without wounding some of them. From these the blood having performed its function goes back to the lungs where it is purified by the action of the air breathed and then to the heart to be again circulated.

This brief description of the nutrition of an animal goes to show the amazing delicacy of the vital processes, and considering that the liver, the pancreas, and the spleen, are all charged with accessory functions in this system of nutrition, it is no matter for surprise that in the alimentation of an animal we have one of the most profoundly delicate series of operations, the safe performance of which is one of the greatest wonders of nature. And yet it goes on operating constantly—as the pulse of an animal beats—forty-eight times in a minute, every beat carrying to the center of life a sufficient supply of aliment by which the whole system is supported, and renewed in fact, completely in time, by this addition to the system of an adequate quantity and kind of nutriment.

This brief but wholly inadequate review of the method by which food is made to support life goes, however, to show what care, attention, and good judgment are necessary for the welfare of a flock, too often fed without thought of the delicacy of the vital organs; and the importance of keeping these in a healthful working condition is that the first qualification needed to insure the successful management of a flock is a due acquaintance with the vital functions of a sheep and a most careful study of the methods required to maintain health by a rigid adherence to the safe and healthful alimentation of it.

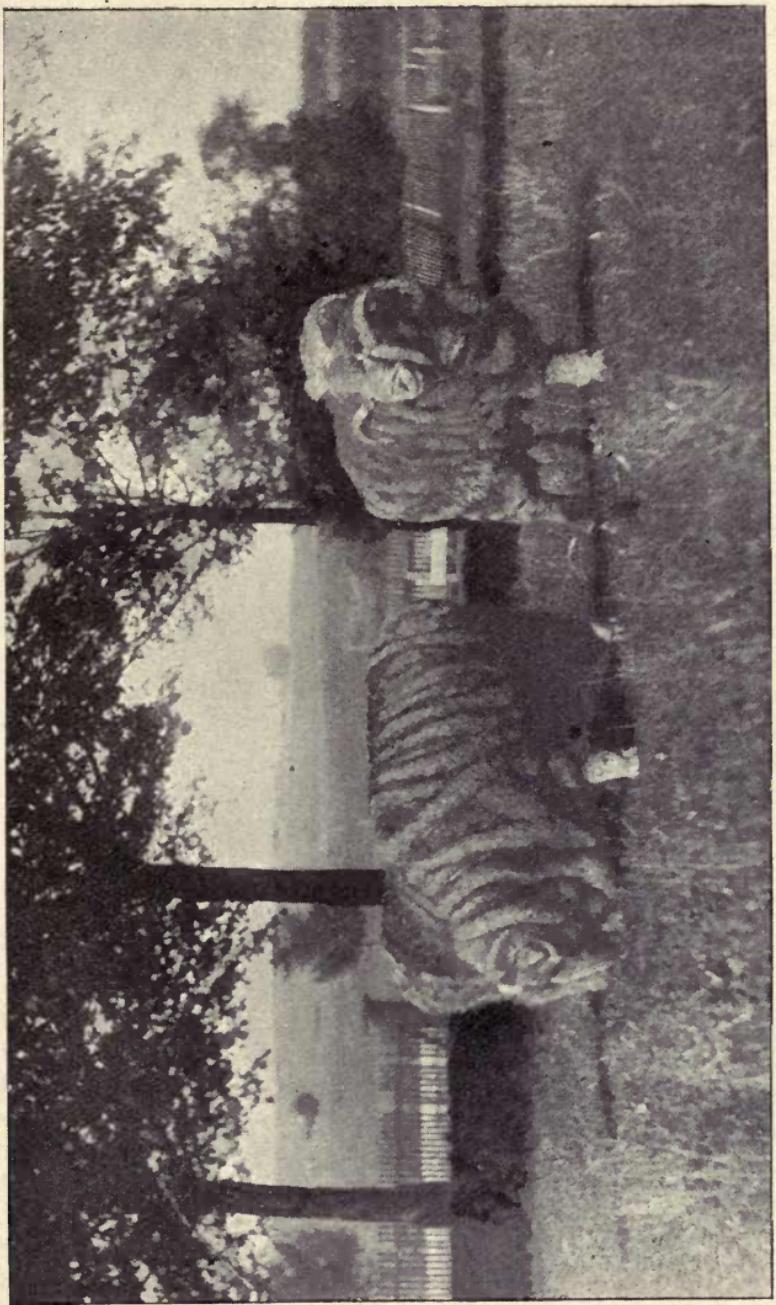
CHAPTER II.

THE VARIETIES AND BREEDS OF SHEEP.

Such a course of culture as has been described, of course, could not fail to establish in time a large number of varieties of sheep. Individual tastes and preferences; the varied practice of individuals; many men being of many minds; differences of climate, of pasture, of soils even, and other environments, it may be sure must necessarily lead to the growth of distinct varieties of sheep. This happened some centuries ago, and even then the germs of the present existing breeds became differentiated as local varieties, best adapted to the conditions in which they were bred, fed, and reared. For we must take notice that these three elements of variation in sheep are profoundly effective in fixing types on the animals concerned. We may take the English breeds as the leading example of this principle, as to numbers of instances, while the American Merino and that of the French, the Spanish and the Saxony sheep of this class, not being missed, but taken as included in our own bright example of successful breeding, the American Merino. Doubtless we may not easily think too highly of the Spanish Merino from which our native breed was first originated, for this breed may be said, as was said by the great Napoleon of the pyramids of Egypt, "forty centuries look down" upon us, when we consider the Merino of Spain. But as that unfortunate nation has gone down in the scale of history, after a glorious past, which we can never forget, so the Spanish Merino sheep, greatly useful in its time, has gone out of history, which has swiftly passed on before it and left it to be forgotten as the present factor in the study of the modern sheep.

THE AMERICAN MERINO.

Let us begin our classification with this remarkable example of American enterprise and skillful culture, and the effect of its environments upon this susceptible animal.



AMERICAN MERINO RAMS.
Bred by E. Peck & Sons, Geneva, Ill.
First prize yearlings at World's Fair.

It was in the year 1801, four years now short of a century, that Mr. DeLessert, a French banker, owning a farm near Kingston in the State of New York, imported a single sheep, one of four shipped from Spain, three of which died on the passage. Mr. Seth Adams of Massachusetts the same year with better fortune imported a pair from France, and probably of pure Spanish extraction and blood, as the French Merino specially was not then in existence, but about to become so only as a special product of pure Spanish blood under French culture. The next year two pairs were sent from France by Mr. Livingston, our Minister to that country, to his estate on the Hudson river in New York. The most important importation, however, was made in this same year by Mr. Humphreys, our Minister to Spain, who brought home with him two hundred. Seven years later our Minister to Portugal, Mr. Wm. Jarvis of Vermont, sent home large flocks, and still more in the two years after. All these sheep were procured under the most favorable circumstances, and were the best specimens of the best flocks that could be selected.

After these other shipments were made but none of importance. These sheep, soon naturalized, thrrove exceedingly, the produce soon greatly exceeded the original flocks in product of wool and general stamina of constitution, and there are several flocks now existing in the United States in which the pure blood, unmixed by any other, still flows.

The number of sheep thus imported amounted to 3,850 head and were made up of the finest of the Spanish flocks that were confiscated by the Spanish Government, as one of the penalties of political offences by four leading Spanish noblemen. There could not have been any more favorable opportunity of thus practically transferring the best blood of the Spanish flocks to a new country and location; and this turned out to be by virtue of the favorable soil and climate, as well as of the energy and enterprise of the New England and New York breeders; and thus the successful transplanting of the flocks of Spain was accomplished. The foundation of the best breed of Merinos in the world was thus laid on the most favorable soil, and has been built upon by the native skill and aptitude of the American shepherds still further with most satisfactory results.



THE VERMONT SPANISH MERINO.

As bred by E. N. Bissell, East Shoreham, Vt. (Ben Harrison 2nd, and 2 yrs. old ewe.)

There need be no surprise at the result, which has been that our American Merino is the best sheep of its class in the world, and that our breeders have the whole world at their feet, offering the highest prices for our rams for the improvement and support of foreign flocks. It has been a marked example of the fitness of our soils and climate and of our fertile pastures for the special industry of the sheep-herd.

A combination of circumstances, however, soon combined to bring on a disastrous speculation, by which, first, the prices of wool advancing on account of the war of 1812, led to an equivalent advance in the value of these sheep. Wool sold for \$2.50 a pound, and sheep brought a thousand dollars for ewes, and fifteen hundred for rams. As soon as the war ended, in 1815, of course the sustaining prop to this speculation gave way, and sheep that had been purchased at these high prices were unsalable at one dollar a head. This is only one instance of the many that have occurred of the injury done to the most intrinsically valuable interests by senseless speculation, in which the cursed thirst for wealth leads men to lose their heads, and not only to ruin themselves but overwhelm the most valuable and important business interests in temporary disaster. This is especially true of the sheep, which has been all through its civilized history a sort of foot ball for politicians, sometimes protected unduly, when it becomes an object for the frantic antics of the speculator; then after a time of excessive inflation a collapse comes by reason of its abandonment to the competition of the rest of the world, in which it is sacrificed with as senseless want of judgment as in the previous instance of its undue speculative inflation. The history of the Merino is a most conspicuous instance of this unwise and wholly destructive course of public policy. It would seem to be the wise part to either leave the sheep alone to work out their own destiny in competition with the world, or to adopt such a wise policy as would ensure due protection to this important source of wealth, and at the same time produce an adequate revenue for the government from imports of wool and woolens, and adhere to this for a term of twenty-five or forty years, during which this great interest might have become so firmly fixed and established, that if it were

thought desirable it might gradually be left to support itself. This has been the course of the British Government, whose policy heretofore has been the strictest protection of native industries, not only by tariffs but by the severest laws, even so far as capital punishment, for transgressors of these laws. For it is only recently that the English statutes, by which hanging was made the penalty for stealing a sheep, and equally severe penalties were inflicted upon those who violated the statutes made forbidding importations or exportation of the products of the flocks, were modified or repealed. And to show the high consideration in which this interest of the shepherd was held, the seat of the highest judicial functionary in England was a woolsack, and even at the present time the seat of the Lord Chancellor of Great Britain is called the woolsack. This is only one of the methods by which the British Empire has attained its vast power, and its citizens their enormous wealth, by which their government dominates the world, and the British flag floats over every prominent location for a fortress; and as the earth turns in its daily course the sun shines continuously on it somewhere. Truly, in the infancy of what is in time to be—if only true wisdom is its guide—the greatest civilized nation on the face of the earth, the American people, should not cast aside the universal experience of the past during which every great empire has laid the foundation for its wealth and consequent power by a due policy of protection of its own interests.

The result of the best breeding of this race of sheep has been marked by a continuous improvement. The weight of the carcass has been increased twenty-five per cent. Its form has been improved in that way by which the yield of the fleece has been doubled; the legs have been shortened and the back broadened at least one-third, the wool producing surface thus being increased, while the density of the wool on the skin is greater. As a wool-bearer this breed has been greatly improved, while the mutton has been made more marketable. And as a sire for market lambs the American Merino, crossed on the Southdown or Shropshire ewe, has been found to excel all others.

POINTS OF EXCELLENCE IN A MERINO.

The American Merino should have a round, well filled up carcass. Evenly proportioned as to length with the plump, round barrel, and deep chest and flanks. The back is straight and broad; the neck is short and deep; the head short and broad on the forehead. The legs are short, widely placed, strong, with a full forearm and twist. The skin is of a clear pink in color, mellow to the touch and loosely held on the body. Paleness of the skin is an indication of a weak constitution, impurity of blood, or ill health. When the wool is opened the skin under it should be clear, bright, clean, and wholly free from seurfiness. The wrinkles and folds in it are mostly a matter of taste, they add but little to the value of the fleece; and the present fashion, and one to be admired, is to lessen them as much as possible. For the some-time fashionable deep folds on the neck add nothing to the real value of the rams, unless it may be for the purpose of improving the lighter bodied native races or the poor Mexican ewes.

The Merino being a wool sheep before anything else, its fleece is the principal point of excellence. This should be close and compact on the skin, having sufficient yolk to preserve the soft texture, and grease enough to protect it from the rains. The close top of a Merino fleece is therefore a protection to the sheep against the weather, and in choosing breeding animals this is a point to be considered in the rams.

As a special wool grower the Merino should have its body as completely covered by the fleece as possible. Thus the whole sheep is enveloped in the fleece down to the feet, and the face is covered except the eyes. The absence of hair in the fleece is a chief point in this regard. The curl of the wool and a wavy appearance of it on opening the fleece is a point to be regarded with favor. So is the softness and elasticity of the fleece. There should not be too much yolk in it; this is a waste so far as there may be an excess over and above the natural quantity required to prevent matting of the fleece, and to give it its due protective character for the comfort and health of the animal.

The eye of a sheep is to be studied as one of the points by which its condition of health is to be ascertained. A

bright active eye, clear and free from all tinge of yellow, is an indication of good constitution and health. Any tinge of yellowness is a fault not sufficiently taken note of in judging sheep, for unless the sheep is healthy and sound in every way, whatever excellencies it may possess in other respects are still worthless to the breeder, if the healthful and sound constitution is wanting.

SUB-BREEDS OF THE MERINO.

As might be expected, and as has happened with cattle, there will always arise in the breeding of any distinct class of sheep, by virtue of the variation due to the different systems, methods, and environments, followed by breeders, some more or less distinct families which have all the special characteristics of the breed, but differ in some special points. The Short-horn breed of cattle—for instance—when in the hands of those two renowned breeders, Mr. Bates and Mr. Booth, soon became differentiated so much as to form two distinct families, known as the Bates and the Booth Short-horns. Each of these still possessed the distinct qualifications of the main breed, but varied as to some special points. Thus one became the best beef animals and the other, with this qualification, possessed excellent dairy qualities. Each breeder it seems, and indeed of necessity, gave a sort of personality to his own stock, and this was maintained by those other breeders who strove to preserve, by similar culture and infusions of new blood of each class, this distinctive difference in minor points, and so infused this personality as may be said into each sub-breed.

This has occurred, as might have been expected, and indeed of necessity, with our Merino sheep. And thus it is that we have some distinct classes or sub-breeds of the Merino, just as have been produced in the case of the Saxony, the Silesia, the Rambouillet, and the American Merino. These do not necessarily enter into competition with the special Merino, but fill that place which will always exist among sheep breeders, and among the sheep farmers as well, which will always be open, and is due to individual preferences. It is well that this is so, for it tends to the maintenance of such a competition among these classes, or sub-breeds, as must give rise to the best efforts of all con-

cerned to maintain the excellence and superiority of the main class of which these may be considered subordinate; and each of which may possess some special peculiarity which renders it more satisfactory to the public generally. Thus we have the so-called Dickinson Polled Merinos, the Standard Delaine Merinos, and the Black-Top Merinos.

THE DICKINSON MERINO.

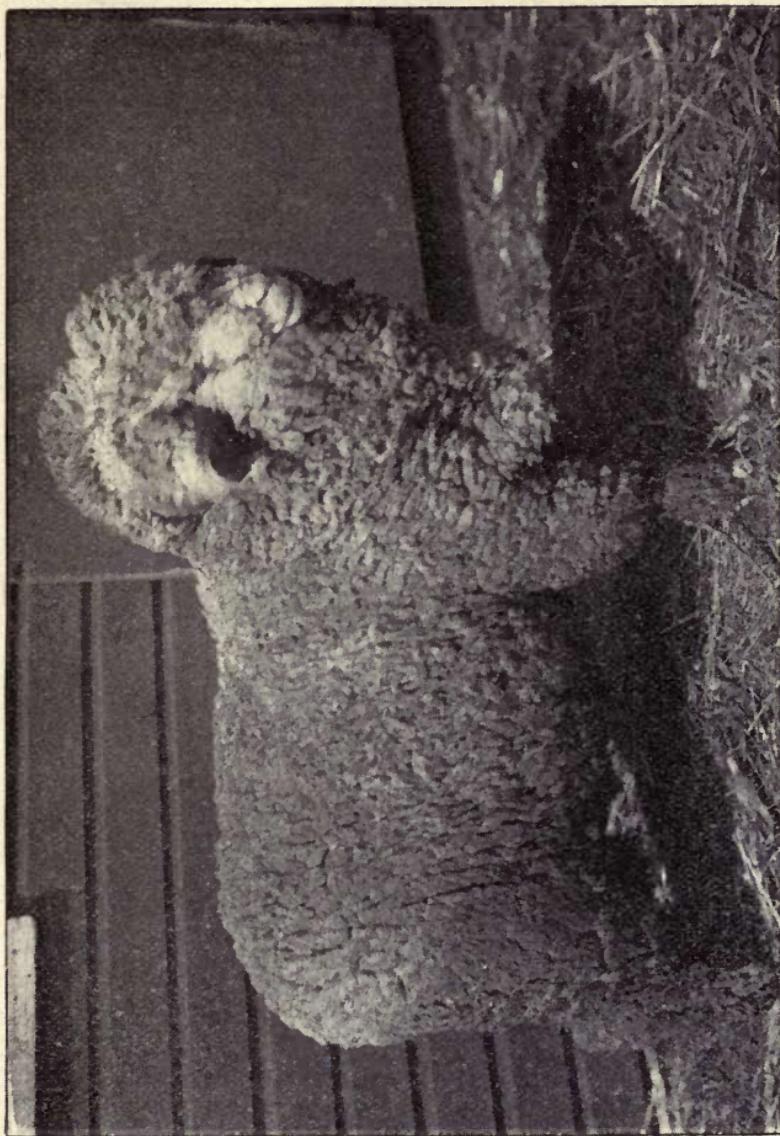
This breed originated in Ohio, by the successful efforts of Mr. William R. Dickinson of Stubenville. It sprang from the Humphrey importation, some of which were purchased by Mr. Rotch of Connecticut who moved to Massillon in Ohio, and carried with him a selected flock of these sheep. This was about eighty years ago. Through some unfortunate financial reverses the flock in part came into the possession of Mr. Dickinson, through whom they in time passed into the hands of Mr. James McDowell, who had been the shepherd of Mr. Dickinson for many years.

This flock was then the only pure bred descendants of the original flock, selected at first from the importation of Mr. Humphrey's. Since 1831 these sheep have been in the hands of Mr. McDowell who has bred them with absolute purity, and with such success that at the present time they are scattered in the hands of over one hundred breeders, who have formed an association in whose records there are now six thousand pedigrees, tracing directly to the original stock.

This breed produces a beautifully-fine standard delaine wool, from four to five inches long, with a soft and glossy fiber, clean and well crimped. The breed is hornless and makes an excellent mutton sheep. It has good size, the rams weighing from 200 lbs. in ordinary condition, and up to 300 when fat and full fleshed. The ewes in good breeding condition weigh 150 lbs. and a finished wether 200 lbs. The fleece in the grease weighs, for rams, from 20 up to 40 lbs. and for ewes 15 to 25 lbs. This sheep has been bred distinctly for its carcass of fine mutton, as much as for its excellent fleece.

THE STANDARD DELAINE.

This breed originated through the desire of a number of breeders of the Delaine variety of the Merino, to improve



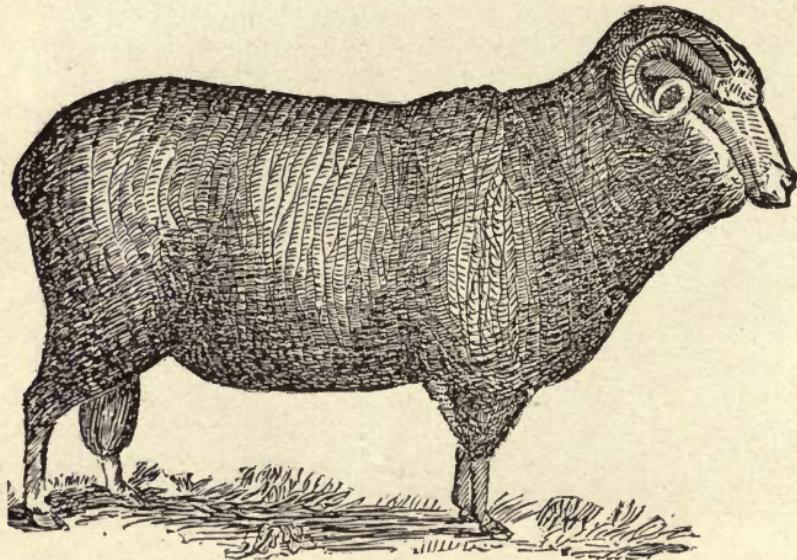
DICKINSON DELAINE MERINO RAM "PROSPERITY."

(SIRED BY "WONDERFUL.")

Bred by H. G. McDowell, Canton, Ohio.

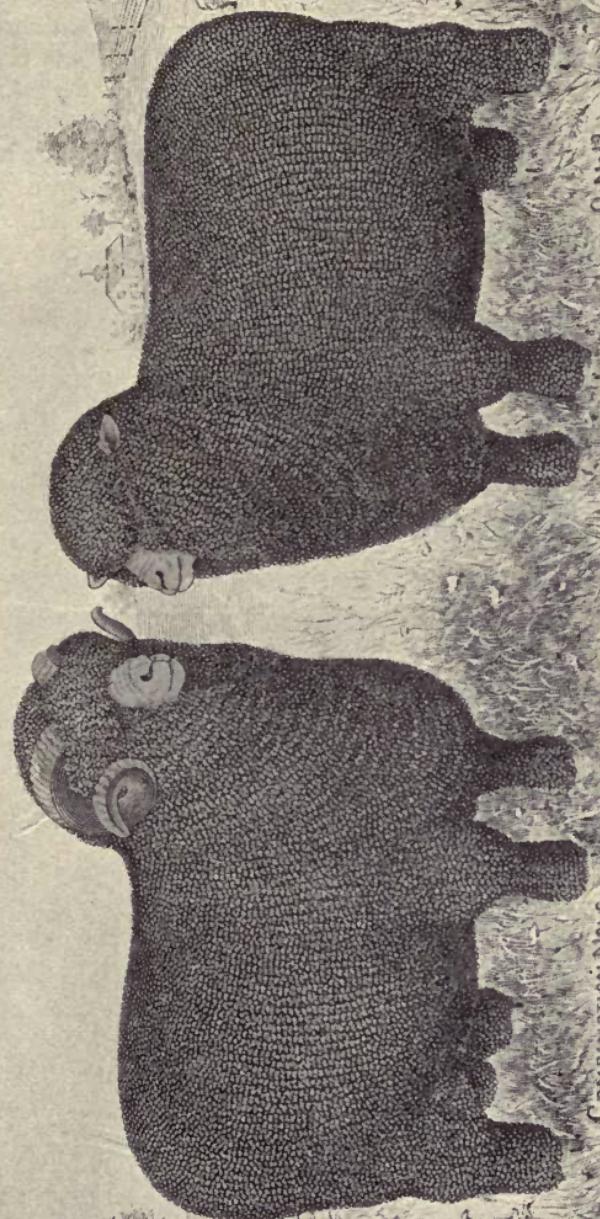
the existing sheep, so as to produce an excellent mutton animal with an improved fleece. A smooth bodied animal was desired, well covered with a good fleece of long stapled fine wool, and having a broad back and deep quarters. The best milking quality was one of the main objects as well as to get rid of the deeply wrinkled body. This desire led to the formation of The Standard Delaine Spanish-Merino Association, in great part due to the efforts of Mr. S. M. Cleaver of Washington County, Pa., a locality noted for its fine sheep and intelligent and enterprising flock owners, for many years past. A scale of points was established in which prominence is given to the fleece, its quantity and quality, length and strength of staple; and equally to the size and form of carcass, the mutton qualities of which are estimated by the deep and rounded quarters, the broad straight back, and the weight of the rams at not less than 150 lbs. and of the ewes not less than 100.

These standards are now considerably surpassed, in fact, as the rams weigh 170 to 200 lbs., and the ewes 120 to 150. This sheep matures early and fattens easily.



DOM PEDRO.

Imported from France by M. Desselert, 1801.



STANDARD DELAINE MERINOS.
Bred by C. S. Chapman & Co., Marysville, Ohio.

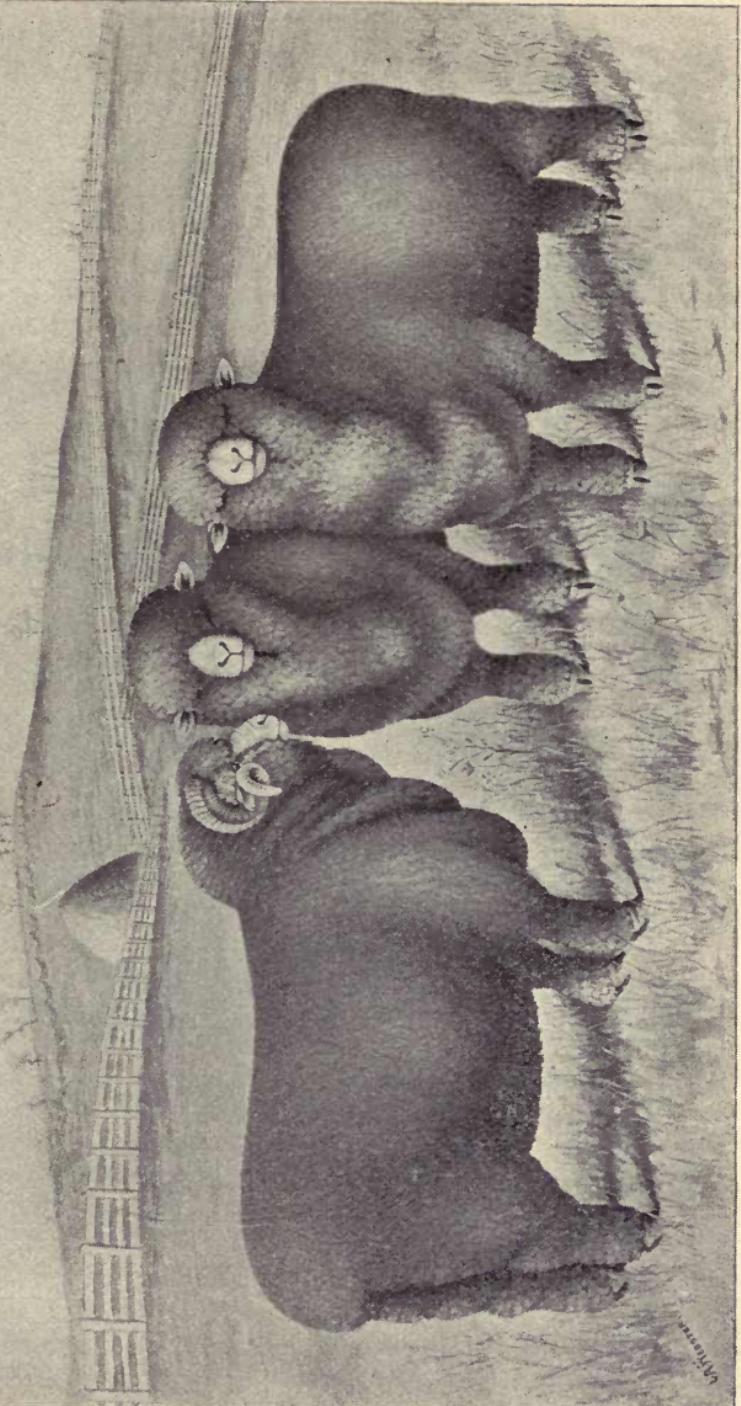
THE NATIONAL DELAINE.

This is another sub-breed of this class which originated in Washington County, Pa., in 1880, mainly through the efforts and influence of Mr. J. C. McNary. This locality has a past history in regard to its sheep and its skillful breeders, common with Vermont, and the outgrowth of it has been a somewhat special class of Merino sheep known as the Washington County Merino. Nearly thirty years ago rams were brought from Vermont and crossed on the sheep then known as the native Merino. This crossing resulted in the form of sheep now known as the American or National Delaine, a sheep with a long fleece fit for combing, and yet retaining its peculiar fineness and strength of fiber, and as well having a larger carcass than the original Merino with far better mutton character. That these different varieties should be formed in the limit of a single county speaks strongly as to the skill and intelligence of the sheep breeders, of whom, those organized in the various parts of the county, each formed in their minds what kind of sheep they wanted to meet the demands of the butchers and the wool manufacturers together; and going to work made each kind of sheep they desired. No more evidence of the intelligence of these breeders can be afforded than these useful sheep to which their ideas have given form in these local sub-breeds. They have satisfied every need of the shepherd; a fine heavy fleeced sheep for the wool manufacturer and a well bodied one for the butcher.

These examples testify to the correctness of the views of the author expressed in the chapter on breeding, by which he shows that variation in breeding is the expression of a personal idea of fitness and value, and that locality, with varying conditions, must necessarily lead to variations in type, just as these instances of these sub-breeds formed by individual instincts, as might be said of the intelligent breeders, and the personality of each breeder, is expressed in his favorite type of animal. That the association of these intelligent breeders to form scales of points and permanent distinguishing types of sheep have been duly formed, and are now in action, is the only means possible of preserving these types permanently; and while each one can scarcely be called a distinct breed, the outgrowth of these if well

NATIONAL DELAINE MERINOS.

Bred by Jas. McClelland & Sons, Canonsburg, Pa.



cultivated must in time eventuate in permanently established breeds, gradually forming distinct characters, and as valuable as the good sense and business skill of those interested may make possible.

THE IMPROVED DELAINE MERINO.

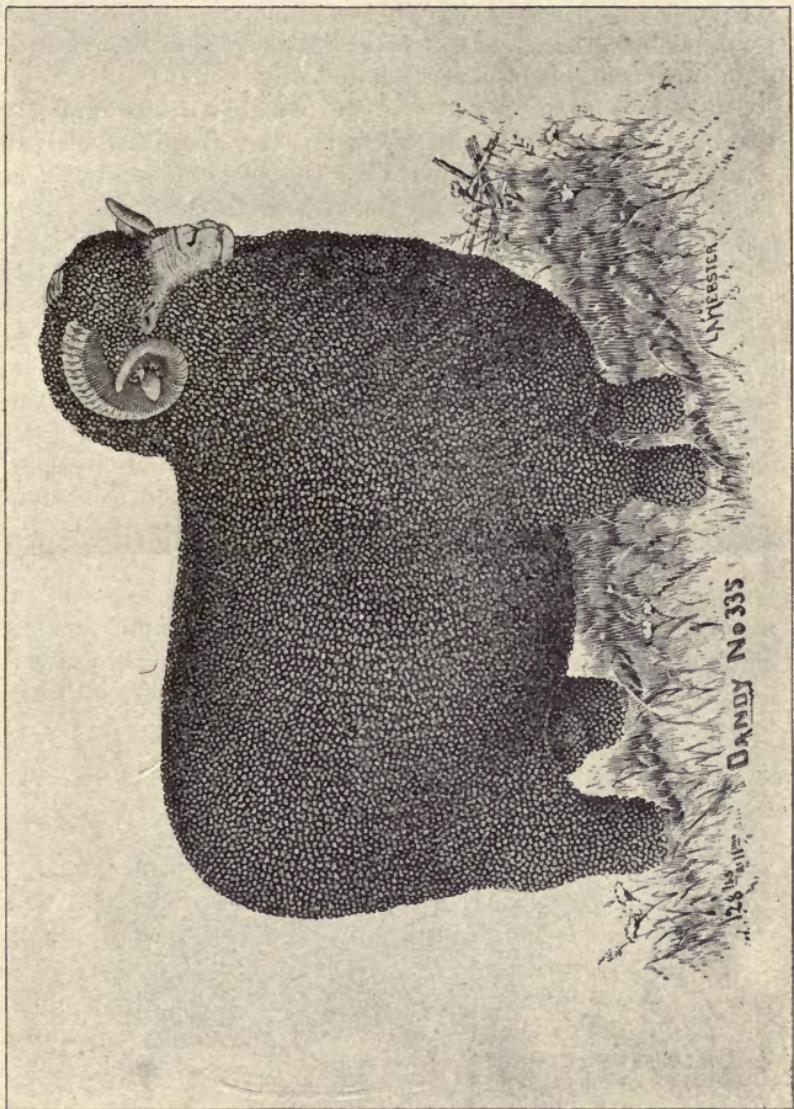
The Improved Delaine Merino is another branch of the Delaine family. In 1890, a registry association was formed in Central Ohio, including the flocks of Messrs. Henry, Long, Hagenbuck, Bailey, Silvens, Turnbull, Horn, Crittenden, Newcomer, Swain, Braden and others, the object of the organization being the preservation of purity in the Delaine Merino and the encouragement of further development in the production of a mutton sheep of large size, strong constitution and compact symmetrical form, with a heavy fleece of fine Delaine wool. No sheep with other than pure Delaine blood are permitted to enter the register.

The weight of a mature ewe of this breed should run from 100 to 120 pounds and her fleece from 9 to 14 pounds of long, white, well crimped and fine delaine staple, showing a free flow of white oil. The mature ram in full fleece should weigh from 160 to 210 pounds, averaging about 175 or 180 pounds.

The association has grown rapidly and now embraces a good number of well known flocks scattered throughout the states and territories, the principal flock centers being Bellefontaine, Urbana and Cedarville, Ohio.

THE BLACK TOP SPANISH MERINO.

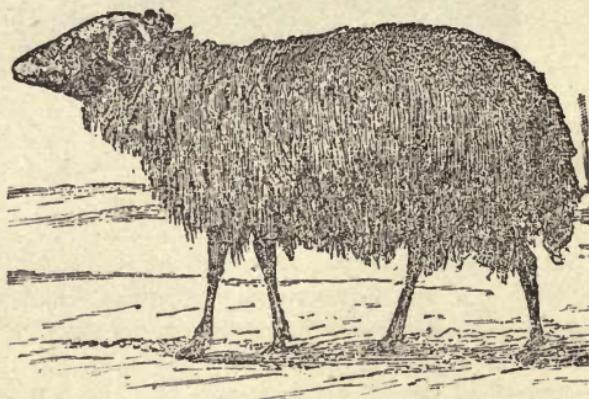
As a distinct breed, dates back to the formation of the flock of the late Wm. Berry of Washington County, Pa., in 1821. Mr. Berry obtained his foundation stock from the famous flock of the late W. R. Dickinson, of Steubenville, Ohio, and bred his flock up with great care until late in the 40's, when it was divided between his sons William and Matthew Berry, from whose flocks came the foundations for the later flocks of William, John M. and C. M. Berry. From these have sprung a multitude of other flocks now widely scattered over the United States. The organization of the flock registry association for recording these sheep and maintaining purity of blood and a high standard of form, fleece and general char-



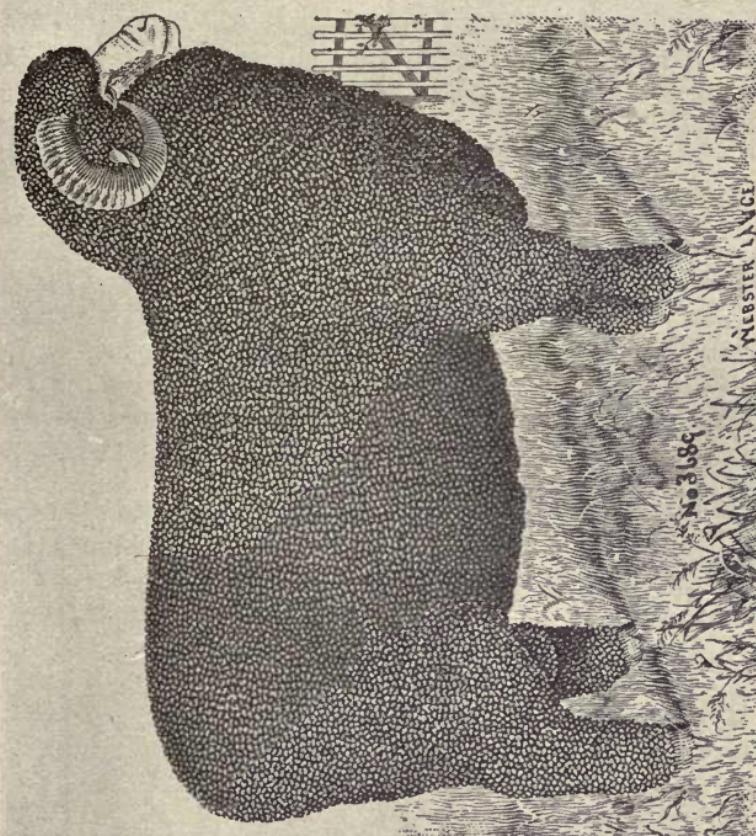
IMPROVED DELAINE MERINO.
Bred by Alex. Turnbull & Son, Cedarville, Ohio.

acter for them, was perfected in the early 80's, and the association is now one of the leading sub-Merino record societies in the country, with headquarters in Washington County, Pa. This excellent breed of sheep is briefly characterized by its chief promoters as follows:

Full grown rams in fleece should weigh not less than 175 lbs., and mature ewes, in fleece, not less than 120 lbs. In normal physical development they should be deep and large in the breast and through the heart, with broad back, square quarters, fine pinkish skin, well expanded nostril, bright eye, clean, healthy countenance, head carried well up, body symmetrical and of good length, of heavy bone, smooth joints, well sprung ribs, broad, flat shoulders, strong muscles, plain body and small dew-laps. Head should be wide with medium length, medium, well-defined ears, covered with soft fur. Ewes hornless, but rams should have good, clear, finely curved horns. The neck medium length and strong, deepening toward the shoulders. Legs medium length, good bone and well apart, and the feet medium size, well turned and firm. The fleece should be even and crimp, covering the body and legs to the knees, and the head well covered forward between the eyes, and free from hair. Staple, medium or fine delaine, not less than three inches long, of uniform length, and fleece compact with free flowing white oil forming on the exterior a uniform dark coating.



WILD SHEEP OF NORTHERN EUROPE.



BLACK TOP MERINO RAM.
Bred by W. P. Penny & Bro., Radnor, Ohio.

THE IMPROVED BLACK TOP MERINO.

This strain of the Merino is represented by a class of sheep of which the prevailing characteristic is the uniform dark top on the surface of the fleece, due to the even distribution of the natural oil which lubricates the fleece of all sheep, but most especially of the various strains of the Merino. It is a question among breeders of this type of sheep, whether the oil and yolk are really of any value to the fleece, at least to the large extent to which it accompanies the wool. This matter has been incidentally referred to in preceding pages and the belief expressed that this oil and yolk is indispensable to this class of sheep, for the reason, that as its fiber is so much crimped and wavy, and inclined to felt, the natural supply of the oily matter of the fleece is indispensable to the actual value of it. The special character of the wool of the Merino classes, and its strong tendency to felt together, render this natural product of the highest value, and we cannot dispense with it.

In the scale of points of this sub-breed of the Merinos, the oil in the fleece is rated at six per cent; the staple, not less than three and a half inches in length, eight; the condition of the fleece at six, the quality of the wool at seven, the evenness of the fleece at eight, the body at sixteen, and the size and constitution at thirty. These figures tell the story of the aims and ends of the breeders of this class of the Merino.

The weights run from 180 for rams to 130 lbs. for ewes, and the regularity of the make up in general goes to figure out a fair mutton animal. The breed originated from the flock of Mr. Dickinson of Ohio, the direct produce of the Humphrey importations from Spain in 1802. By close but judicious breeding, this present strain—or breed as it is now entitled to be called—has become differentiated from the common American Merinos, and is marked by the special characteristics set forth in the herd record of the Association, in which six hundred and sixty animals are entered, being the aggregate of nine pure bred flocks all going back to the original Humphrey importation. The flock of the President of the Association, Mr. Robert Johnson of Washington County, Pa., was founded in 1844. Since that time the best rams to be procured have been selected, but for



IMPROVED BLACK TOP MERINOS (YEARLING).

Bred by President L. L. Harsh, Union City, Mich.

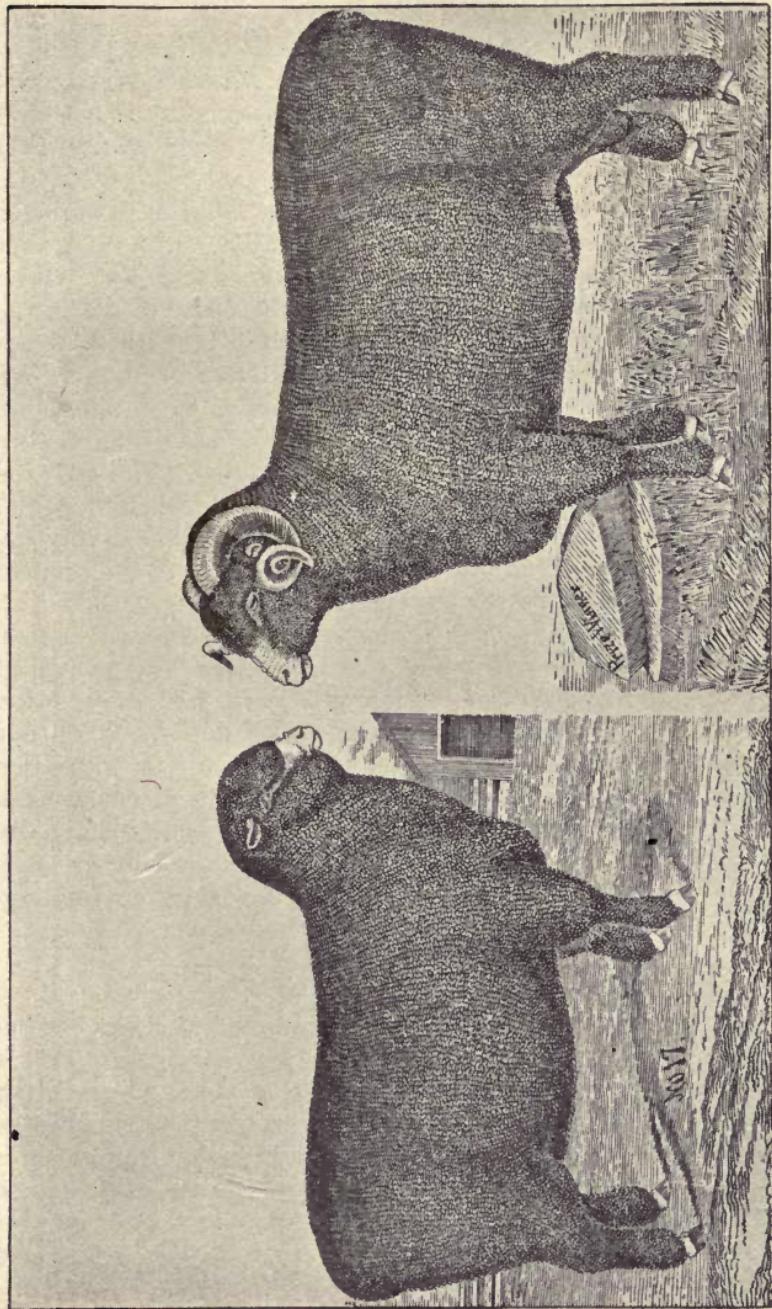
thirteen years past the flock has had no infusion of outside blood.

THE SAXONY MERINO.

The sheep is one of the indispensable acquisitions of the human race, and all the kinds in existence, and those that may come into existence hereafter, will find a welcome and a home among the rest of the flocks. Once on a time the Merino, and the Saxony Merino especially, was the highest valued of all the ovine race. That was when the exquisitely fine fleece was in high demand for the manufacture of the best broadcloths used for the clothing of the wealthy and fashionable people, who dare not appear at any social gathering or festival except in this finest of all attire. But this habit, both in respect of manner and dress, still prevails, and this finest wooled sheep of all the fine wool class, will possibly ever be in the first place among the finest wooled sheep.

It is the offspring of the ancient Merino, from which the Spanish flocks descended through two thousand years of the history of a turbulent period, during which our present civilization was in process of slow growth. In spite of wars and the dense ignorance of the so-called dark ages, the Spanish flocks survived, and in time became the progenitors of this race. By reason of the well adapted climate, and high culture of the farms, as well as of the sheep, this breed improved in quality, and soon after its firm establishment it became the chief producer of the fine wools for which Germany has long been noted, and now stands in the first place among the nations for its fine woolens, especially for the finest cloths and hosiery. In respect of climatic adaptation, the United States is first in the whole world, and a place is, and always will be, found for every kind of sheep or other domestic animals; and as our cattle and horses have surpassed in value and excellency their progenitors in other countries, so the sheep of every kind may find room and development by the culture of our intelligent shepherds.

The fleece of this sheep has sold for three dollars and twenty-five cents a pound, and while intense speculation at times has been disastrous to the breed along with other of



SAXONY MERINOS.
Bred by John G. Clark, Lagonda, Pa.

the Merino class, yet it has survived and its wool known as Electoral, from the title of the Saxon Prince who fostered it with much care in its earlier days, always brings, and doubtless always will bring, the highest price of any wool produced.

Its greatest value, however, is for crossing on the coarser breeds for the purpose of improving the fleece, and past experience goes to show that this, the finest wool sheep existing, has undoubtedly an important place to fill in the future rearing of a larger bodied animal with a fleece of equal fineness and strength and brilliance of staple. We may know what has occurred in this line of improving sheep, but our dreams, even, may not equal the reality which may happen in time in this direction. The advance of every industry in every direction, is a constant denial of the thought that we have reached perfection in any degree in the breeding and rearing of sheep, or in the product of wool. And the field for enterprise is wide open, and always will be for skillful experiment by advanced breeders. Of late years the carcass of this sheep has been increased in size, and like that of the larger French Merino varieties, makes fine mutton, having an excellent flavor. With our greater advantage here we may well expect to make this once smallest of its race equal to any others of it, as a mutton sheep. In its original home it has been considerably improved in this way, and in the hands of the equally intelligent and skillful American breeders it will have a successful future.

THE RAMBOUILLET MERINO.

The so-called Rambouillet Merino breed of sheep has become exceedingly popular during a few years past. This is really the true French Merino, quite as much so deserving this name as our native bred Merino deserves to be called as a distinguishing name the American Merino. For it has a longer history as a distinct family of the Spanish Merino than the American variety has, for it was first originated some years before the first importation of the Merino into the United States.

It was in 1786 that the French Government, with the intention of founding a special race of sheep fitted for the



RAMBOVILLE YEARLING EWES—WEIGHT 355 LBS.

Bred by O. E. Lincoln & Son, Milford Center, O.

climate and other conditions of the country—then having no distinct and really valuable breed of sheep within its borders—purchased, with the friendly help of the Spanish Government, over three hundred of the finest specimens of the sheep of that country. A suitable farm for the accommodation of this flock was procured at a place known as Rambouillet, not far from Paris, and once the residence of the kings of France. In the beautiful park near the otherwise unnoteworthy village of this name, this flock was cultivated with the highest skill by the Government for the advantage of the citizens. No sheep were sold for many years, nor until—by selection and breeding—a distinctly new race, indeed a well-defined breed, was produced differing in several important points from the original foundation stock.

It was increased in size, and even more than proportionately to this in the weight of the fleece, the wool of which was increased in length to fully three inches and even more, while the exquisite fineness and delicacy of fiber was in no ways depreciated. The size of the sheep became double that of the original Spanish flock, full grown ewes weighing up to two hundred pounds, and the rams up to three hundred, live weight. This improved fleece became the valuable staple for the manufacture of those popular dress goods known as the French Merino, as well as for mixed fabrics of cotton warp and weft of this wool, and which were known as delaines. From this style of exceedingly popular fabric, which was beautifully printed in the French factories, this sheep has taken the sometime name of the Delaine Merino. Here it takes the name commonly of the place of its origin as the Rambouillet breed, and truly it deserves this popular name in commemoration of the place of its origin, which will doubtless retain this name, and for years to come in the future in association with this magnificent sheep, valued both for its flesh and its wool, when all remembrance of the frivolous and vicious occupants of the park and ancient chateau will have been lost in the then long past.

The author visited this flock in the year 1848, and was entertained in the most cordial manner by the superintendent, who prepared a saddle of the mutton, cooked especially in the American style, as a sample of the excellent



TWILIGHT AT GOVERNMENT FARM "RAMBOUILLET," FRANCE.

quality of the meat. The sheep had been fed on the fine pastures of the park and on beets specially grown for the flocks. The meat was distinctly equal to the best of the English mutton of the choicest breed of that country, the Southdown, and showed that the skillful breeding and the really scientific feeding of the sheep, had transformed the tough, dry flesh of the original Spanish sheep into one of the best market meats in the world. This point is one to be well considered by our breeders of this sheep, for the future prosperity of the American shepherds is to come, not from the wool alone, but still more from the mutton, which is so rapidly coming into popular favor everywhere; and even in the Southern States, in which mutton has scarcely ever been thought of as a food, and good meat of this kind is practically as unpopular as it is poor and undesirable in quality.

It is one of the good qualities of this sheep that the fleece is far more profitable for its weight than our native Merino. This is due to the absence of the excessive quantity of yolk and gum in the wool. The result of this of course is to increase the proportion of actual wool in the fleece. Fleeces of nearly fifty pounds weight—this of course as taken from the sheep—are by no means surprising; such a weight of course is the product of full grown rams, but yearlings have given fifteen pounds for the first shearing; over twenty-seven for the second; thirty-seven for the third; and forty-eight for the fourth. These weights are not of unusually long wool but are due to the actual density of the wool on the skin, which is one of the common features of this sheep.

There are two other varieties of the Merino, or the most valuable short fine-wooled sheep. These are the Silesian and the Saxon Merinos. But as these sheep are small, the fleece light, and too fine for the now prevalent classes of woolen goods, they are merely mentioned without going in any way into a discussion of their special characteristics. It is scarcely probable that in the present, and doubtless future progress of our woolen manufactures, we shall ever need to find the rearing of these special fine-wooled sheep profitable. It will be the future business of the shepherd to supply the demand for mutton, a demand that is unquestionably bound to increase steadily, until we shall approach, if not overtake and pass, the condition of the sheep industry in

Great Britain, where there are no less than 240 sheep to every square mile, or three to every eight acres, while here we have but nine sheep to the square mile, or one only to each seventy acres.

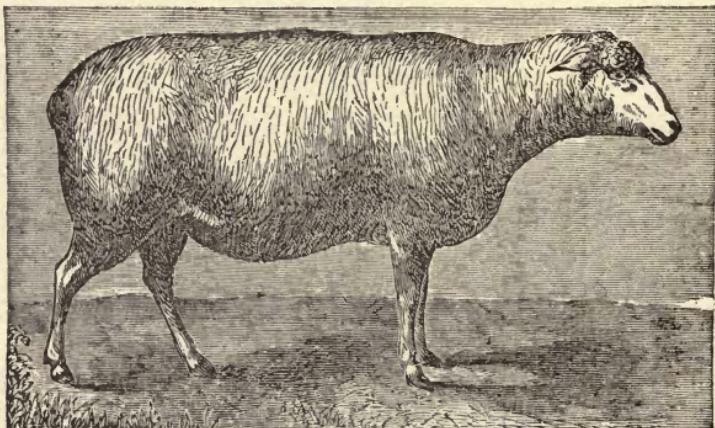
With this view in the not far distance, it is quite clear that sheep that are of no value for mutton will never be able to compete with those which supply our most valuable manufacturing industries with its raw material, and when mature for the market, either as a lamb or a mutton, will supply the ever-increasing demand in this direction. This view is to be always considered by the American shepherd as the basis of a successful choice of the flock.

THE FRENCH BREEDS.

It is one of the most conspicuous facts in regard to the culture of sheep that the most attention is given to breeding and feeding the flocks in those countries in which mutton is a favorite and important article of food. The English people consume more of this meat than any other nation—indeed doubtless as much as all other nations put together. And while the English are beef eaters to a large extent, yet their mutton furnishes more than a half of their flesh meat. The result has been that this nation has paid more attention to the breeding of sheep and have more varieties than any other nation. So that it is the fact that in furnishing our farms and ranges with flocks we are forced to look to Great Britain, which is England and Scotland combined, for our stock, and also for the replenishing of it with new blood. It may be, and doubtless will be, that in a few years more American shepherds will have so far acclimated their sheep and have so successfully bred them, and by the exercise of such skill as many of our foremost shepherds possess and apply to their special industry, we shall be able to depend wholly on our native flocks for all our breeding stock as well as have created such special families as will best suit our climate and conditions. Doubtless our system of agriculture will improve under the stimulating effect of the high culture of our flocks, and thus the sheep, as the old adage goes, will prove to us that it has a golden hoof by the vast increase in wealth it will secure to our agricultural interest.

It will be of interest, however, to know something of what is doing in this line of sheep breeding and culture in other countries, for instance in France, where the Merino has achieved a world-wide notoriety for its special value as a wool producer, as well as for a very good mutton sheep.

The Merino stands first in France as it does in Germany and Spain. But on the whole the rather stolid and careless system of husbandry in those countries is not well adapted to enterprise or success in improving the live stock of any kind. But some of the most intelligent French breeders



LEICESTER-MERINO CROSS.

have recently taken considerable interest in the improvement of their flocks by crossing on them the English breeds, especially the Leicester and the Southdown. The former cross with the Merino has produced an excellent sheep with a good carcass and a valuable fleece, and the produce of this cross is the most popular, as it is the most valuable. This good work has been done in the best cultivated districts as Champagne, Beauce, and Chattillonais. There the best farming in France is to be seen, and sheep rearing is one of the most profitable parts of it. The most common sheep of these localities, however, is the cross of the old natives by the French Merino. The produce of these crosses go by the name of Metis-Merino or half-bred Merino. The Merinos have been crossed with the English Leicester with the result

of making an excellent mutton sheep, which was received with much favor as something new to the French people. This cross, however, for want of sustaining by new blood has retrograded and fallen into some disrepute, not the fault of the sheep at all, but for the reason that the French breeders do not possess the art and skill of those of England. It should be said, however, that as regards the Merino, especially under the care of the manager of the Rambouillet farm, this want of skill finds a noted exception.

The French possess some native long-wooled sheep, the best of which are to be found in the localities of Normandy, Picardy and the Vendean. These sheep, however, are worthless as compared with the English breeds, as they still retain all the ungainliness and ill form of the old races before any skilled attempt was made for their improvement. These breeds are noted for their long legs and thin thighs—all bare of wool, long drooping ears, and coarse thin wool on their sides. But they have the advantage of easy fattening when fed for mutton. The American traveler who is entertained with the gigot, as the leg is called, of the native flocks is ill satisfied with the dry and coarse meat, especially after having been used to the English Southdown or Leicester leg. One of the picturesque sights on the French pastures, on the western coast districts, is the shepherds mounted on high stilts guarding their flocks apt to get out of their sight behind the low hummocks or in the frequent hollows of the broad almost uninhabited Llandes, lying between the considerable cities of Bordeaux and Bayonne. This almost barren region, a waste of sandy land overgrown by low bushes and coarse herbage, among which the lean, ill-conditioned flocks of scraggy-wooled sheep range and feed, is the locality of wretched hovels inhabited by a stunted race of shepherds who clothe themselves in the skins of their sheep, the legs of which furnish coverings for the limbs of the people, being drawn on when soft and pliable and yet warm from the stunted sheep, and stay on until they are worn off, when they are renewed. The skins also furnish jackets for these picturesque shepherds, possibly such as kept the flocks of the patriarchs in the old days of Jacob, who tended doubtless in some such manner the flocks of his father-in-law, and paid for his wives in the staple currency

of the time—sheep from his flock. It is an amazing thing to an American to see such a sight in this advanced age and compare it with what he sees among the flocks of his own country or those of England and Scotland.

The famed cheese of Roquefort, however, leads the traveler in search of information about the sheep of this country to a somewhat more entertaining sight. This is the flocks of quite good sheep kept for their milk, of which the finest cheese in the world is made, and which brings in the New York stores one dollar a pound. The ewes are regularly milked, and having been bred for this product, yield quite a considerable quantity of rich milk. The sheep's milk is rich in fat, having one half more of it than that of a cow. This sheep is kept and fed with much care on the sweet pastures of the limestone soil of this noted locality. They are a well formed race with good frames, but not noted for their proclivity for wool bearing.

At the French agricultural exhibitions the imported English sheep take the first prizes, and the favored breeds of them are the Southdowns and the Oxfords, certainly proving that the most advanced of the French shepherds have at least some faculty for distinguishing good sheep sometimes.

The advanced American shepherd, however, has not much to learn from the French sheep breeders except so far as to discover the effects of ages of neglect, as well in a few instances the advantages of skillful breeding. The thought occurs, unavoidably, that it is a mark of the high civilization of a people to find fine flocks of sheep, as it is equally to find intelligent and skillful breeders in any country.

France has something over twenty-one million of sheep of which there are 302,481 rams, about thirty ewes for each ram, nearly 4,000,000 wethers, nearly as many yearling lambs, and 4,700,000 young lambs, according to the census of 1895, which is the last one published.

BRITISH BREEDS OF SHEEP.

The Merino, previously described as the American, is the only breed which we can claim as distinctly a product of the energy and skill of American breeders. It must be taken into account that to establish a breed, much time is required; a century is short enough to establish and firmly

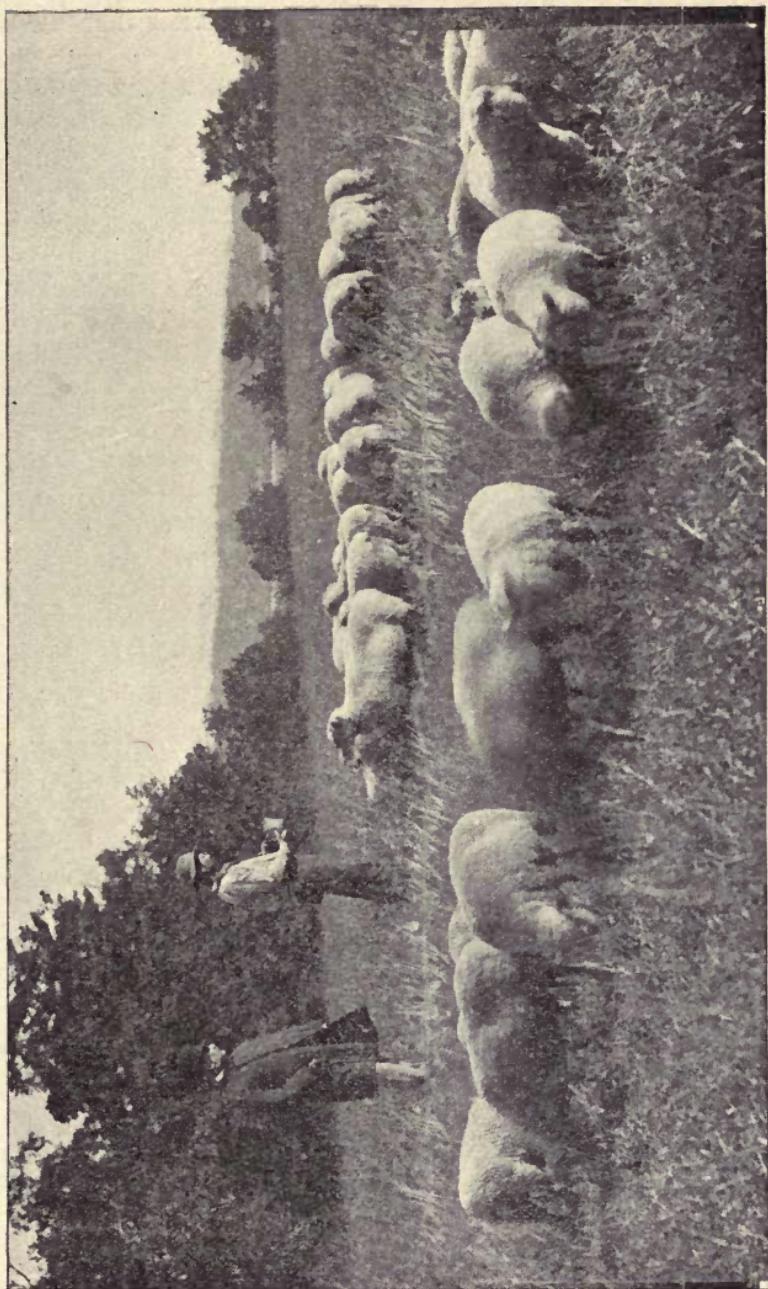
fix a type even on so impossibly an animal as a sheep. Consequently as, with the exception of the Merino, there has never been any effort to make a special acclimatation and variation by special treatment and culture, we are still rearing what are essentially the foreign breeds, and of these those native to Great Britain are the kinds kept on this continent.

Thus in describing the breeds now in the hands of American shepherds, we have so far nothing by which any one of them may be differentiated as in any way American by any variation. The descriptions of the varieties now kept here, with those of some kinds not yet introduced or established to any extent, which will be given, very closely tally with those found in the English live stock records, and this we choose to do because so far we have not here departed in any conspicuous manner from the real English types, as indeed these are yet our own standards, and importations are still making very freely to maintain these types. It is a question sometimes discussed by the special live stock journals here, if the time has yet come when we should stop this continued importation to restore some supposed failure in quality of the home bred sheep by deterioration due to our dryer climate and our different methods of feeding. We do not join in this thought at all, but have the firmest possible belief that as with the American Merino so with the other breeds of foreign sources, the time will come when our breeders may safely depend on our own flocks for the sustentation of our adopted breeds, and put them on as excellent a basis as we have put our Merino. This is not, however, to be done in a day, nor is its work to be lightly undertaken, but there are skillful and scientific breeders on this side of the Atlantic who will in time take this work in hand, and due encouragement should be given to their efforts to establish true American breeds by the full acclimatation of our present breeds, and others, which it is the intention to show may be yet added to our stocks. In the meantime we shall take advantage of the good work of the English breeders whose best specimens of sheep will yet find an acceptable market on this side of the ocean, and still further furnish us material which in time we shall be sending back across the ocean as welcome contributions of American skill

and enterprise, for the benefit of the old flocks, as we have done already in regard to our finest specimens of cattle and horses.

SHORT-WOOL SHEEP.

The Southdown is the generally accepted type of a mutton and short clothing wool sheep. It is moreover worthy of the first place in this category, for the reason that it has been the sire of all other so-called Down breeds, crossed on various old-fashioned races which had become obsolete, and indeed unprofitable, in competition with the finer flocks of the eminent breeders who had brought their sheep to the highest degree of perfection. It is one of the most beautiful sheep existing; its smooth even body, its round clean barrel, its short legs, fine head, and broad saddle, with its sweet, tender, never over-fat meat, make it especially the ornament of a well kept lawn on any gentleman's country place as well as the profitable stock of the farmer or special breeder. Its mutton has long been held in the highest consideration, and although it has some active rivals in general popularity, it will be very severely missed if it were to fall into neglect. In breeding it is always necessary for the maintenance of the desired type to go back to the original sires at times, to renew or strengthen certain points of excellence in the cross breed. And as the Southdown has been the sire of so many of our best breeds, it will always be desirable that this breed should be kept in reserve for future usefulness. For a farm sheep fed for domestic use and for the home supply of wool, as well as for its other pleasing and profitable qualities, this should be well thought of among other claimants for general favor. The wealthy proprietor of a farm or country place might always have a flock of Southdowns on his lawn for ornament, and as well for the supply of his hospitable table. If this breed is ever suffered to become extinct it will be a most serious loss in the future; for it has many valuable, profitable points. Its lamb from a Merino or a common native ewe is the most popular for the market. The market men recognize its plumpness, its light offal, its popular black face, and its tenderness, juiciness, and fatness; all indispensable requirements for the table. This cross-bred lamb has been sold by the author for



THE SOUTHDOWN IN AMERICA.
As bred by J. Hobart Warren, Hoosick Falls, N. Y.

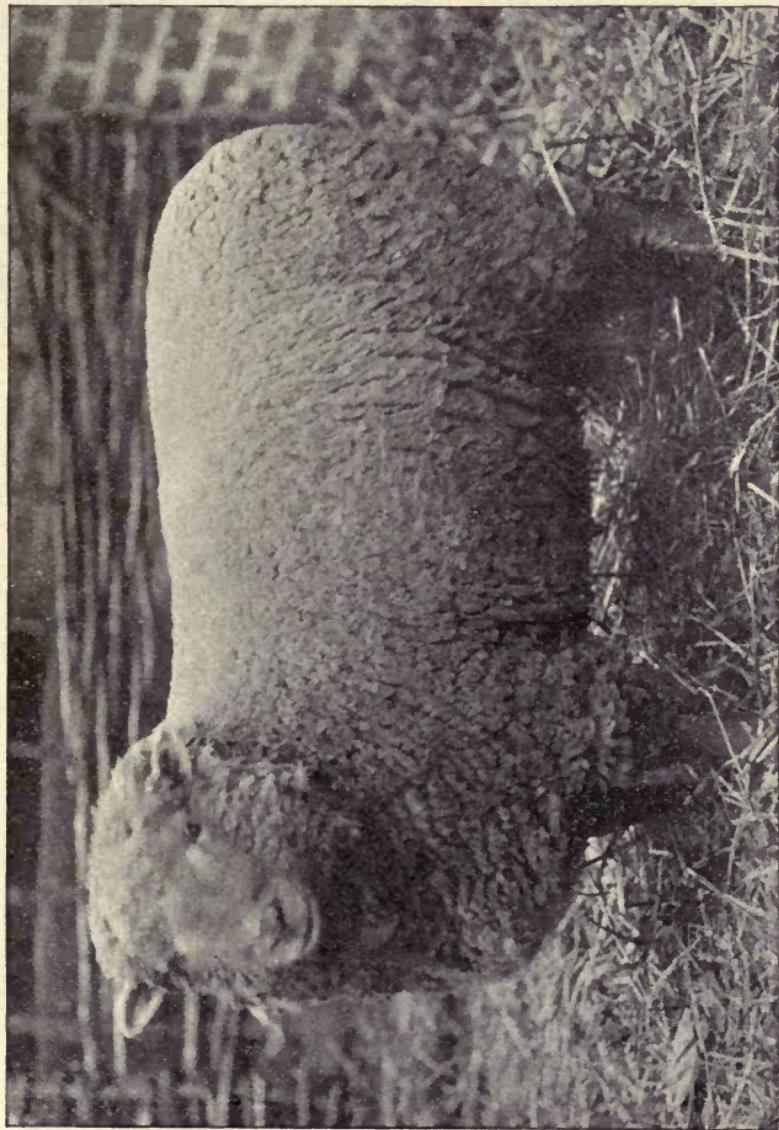
ten dollars a head for the earliest, and never less than three dollars when under three months old. It is not the size but the quality of the market lamb which regulates the price of it to the breeder. We all know how difficult it is to change a popular taste and start it in a new channel; and this old popularity of the black or smutty faces, and their plump round carcasses, will not be easily altogether done away with.

A well fed Southdown should weigh 18 lbs. the quarter at a year old, which is near the popular margin as to weight; at two years old a fat wether will easily make 33 to 35 lbs. to the quarter, butchers' weight; and yield two-thirds its live weight in marketable meat.

There is always a market for the wool, which is one of the standard staples for flannels and clothing fabrics. And it may be said in favor of this once most common sheep, that it is one of the most easily kept of all breeds. Its native home on the thin chalk downs of Southern England, of which the herbage is thin and short, but very sweet and nutritious, indicates the kind of lands on which this sheep will do its best as to profit.

THE SHROPSHIRE.

The Shropshire shares the popularity of its chief progenitor, the Southdown, whose dark face and legs it inherits. The original type, the Morfe Common sheep, had a dark spotted face and horns. It was a small sheep, yielding a fleece of not over two pounds, and making a dressed weight of eleven to fourteen pounds the quarter. This sheep was crossed by Southdown rams which quickly gave an improved quality, but the size was not profitable. The Leicester sire was then introduced which gave the desired size and weight, and increased the length and quantity of the fleece. By very skillful breeding the cross has been brought to a fixed type without any indication of reversion in any way. It may now be considered as an established breed, and able to support its present high character as a farmer's sheep, or for the range flocks. It is one of the hardiest sheep, except perhaps as to the unusually early lambs which at times may need some protection when coming in advance of the season.



SOUTHDOWN RAM "JACK," 386, VOL. 2.
S, Selsey 392, Vol. 1.—*D*, Pagham Harbor Ewe by 344, Vol. 1. From the Pagham Harbor Co.'s noted flock
of fully registered Southdowns, Selsey, England.

Its mutton is excellent, but like that of all other sheep it is affected by the food, and for its best quality should be finished on such succulent food as turnips, or mangels, but best of all on sugar beets. It lives well on thin pasture and is easily fattened for market.

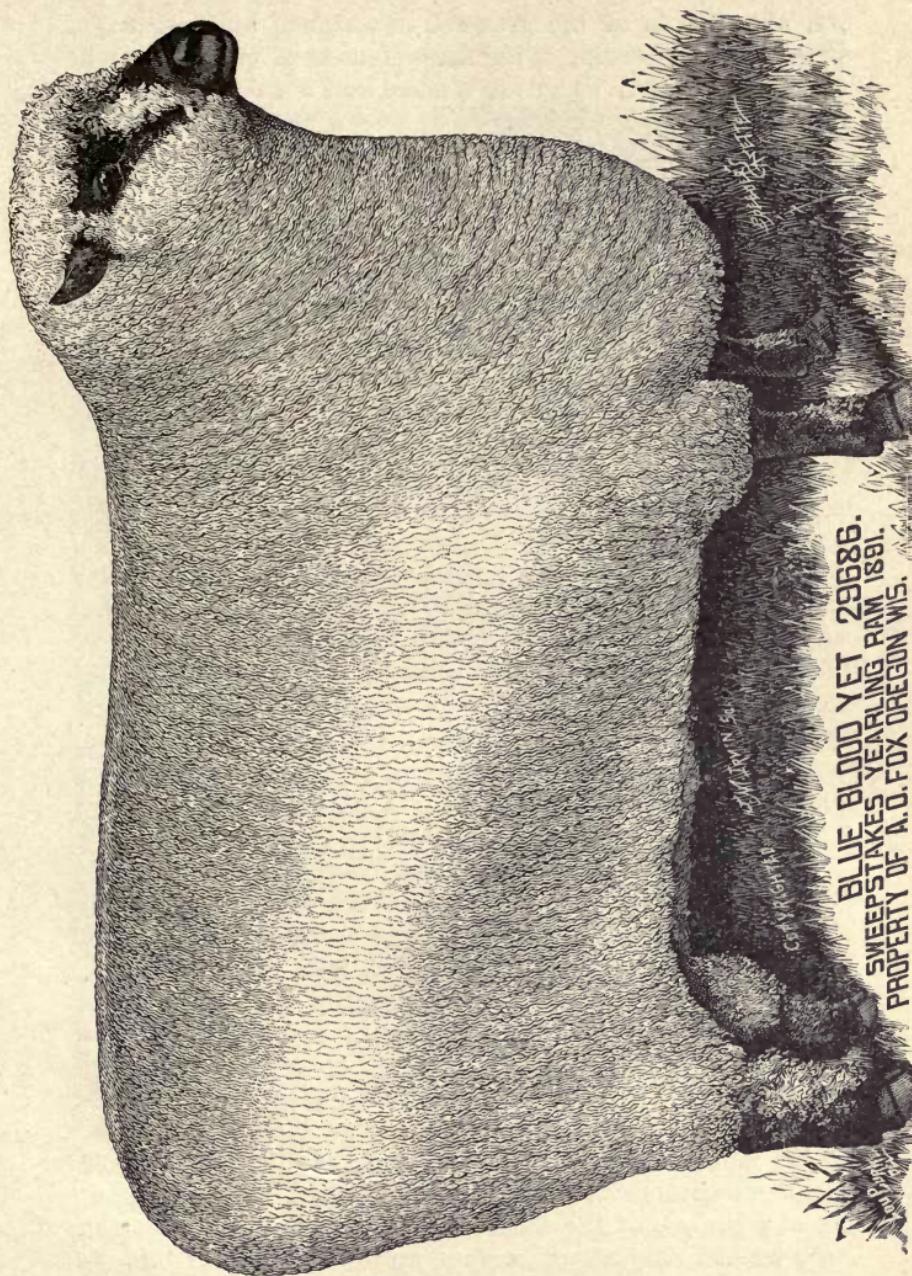
Its fleece is longer and a little coarser than that of the Southdown, and that of a good ordinary flock of ewes should weigh seven or eight pounds to the fleece. Its average dressed weight is twenty to twenty-two pounds to the quarter, when finished in the best manner.

The Shropshire's face is longer and larger than that of the Southdown, the nose is slightly protuberant (Roman) in form, the ears a little larger. The face and legs are blackish brown or sometimes mottled with gray. White spots on these places are objectionable as considered from the standpoint of the standard of excellence, and black spots on the body should be held as a disqualification, especially for breeding animals. Thin ears are indications of tenderness of constitution, and should be objected to by those who desire to maintain the stamina of the breed. A somewhat run-down and neglected flock has been immediately restored by a new cross of the Southdown. The high character of this breed is shown by its appearance all over the U. S. and Canada.

The fleece should be wholly free from black hairs, fine in staple, somewhat longer than that of the Southdown, and closely set on a clear pinky skin. Breeding for increased weight of fleece has resulted in producing coarse wool, and in selecting rams the fineness and close setting of the fleece are to be considered before mere weight. This breed is essentially one for the farm flock, while it is duly hardy and a fit rustler for the ranges. It has a strong constitution, good feet, and is especially free from the common diseases of the flocks.

THE HAMPSHIRE DOWN.

This is a cross breed, of which the preponderating characteristic is its early maturity. Sir John B. Lawes, in his most instructive experiments in feeding, proved that the Hampshire made more weight of carcass from the same quantity and kind of food, than the hitherto unsurpassed Southdown. The principal point in favor of this breed is its early matur-



BLUE BLOOD YET 29686.

SWEETSTAKES YEARLING RAM 1881.
PROPERTY OF A.O. FOX OREGON WIS.

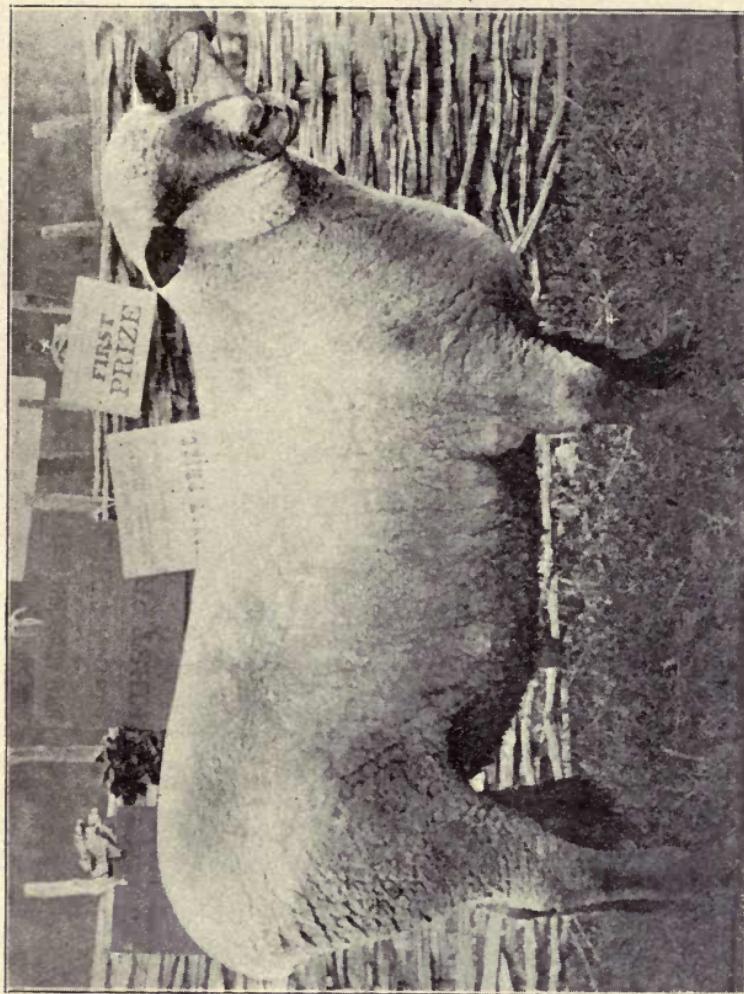
SHROPSHIRE RAM. PROPERTY A. O. FOX, "WOODSIDE FARM," OREGON, WIS.

ity, and this is of the greatest importance in these days, when time for feeding is the main element of profit. As will be observed later, when the science and art of feeding will be discussed, it is far cheaper to feed a young animal than an old one. For every part of the young animal is growing; the bone; vital organs; the whole of the carcass, flesh and fat; all gain by the food; and the system is more amenable to improvement in a young animal than in a mature one; less of the food being lost in mere existence, as compared with growth. Thus a quick growing animal in the early part of its life is the most cheaply fed, for the cost of the food and attention are the least for the most increase in weight.

The whole system of breeding this sheep has been to reach this end, and the exceedingly hardy original stock—a large horned sheep which ran at large on the open downs of Central England so far back as the time of the old Romans, when they occupied the island, and which supplied the fleeces for the first woolen factory established at Winchester during the Roman occupation about twenty centuries ago—was naturally fitted to establish a breed with strong constitution and ability for improvement. This breed has remained one of the old standards since that early time, and by its survival to within eighty years ago, when improvement first began, proves its fitness to survive in its hardy constitution and its intrinsic value as a wool bearer, for which it was originally valued.

The first effort made in its improvement was the use of Southdown rams for crossing on the native Hampshire ewes. The ancient race had a large bony narrow carcass, large heads, prominent Roman noses, long curly horns, the carcass was high at the withers, narrow and sharp ridged along the back, but it was the largest short woolled sheep in existence.

To make of this ungainly animal one profitable to the farmer for its flesh and fleece, was a problem to be solved by the eminent improvers of live stock of all kinds in those—now a century old—days. It was solved as others have been by the use of the short-legged, broad-backed, thick-set, close-wooled Southdown, a very anti-type of what this old Hampshire then was. The first crosses were effective to gain the points the original breeders of the Hampshire



THE AMERICAN HAMPSHIRE.
Property Standard Meat & Live Stock Co., Rawlins, Wyo.
J. G. Massey, Mgr.

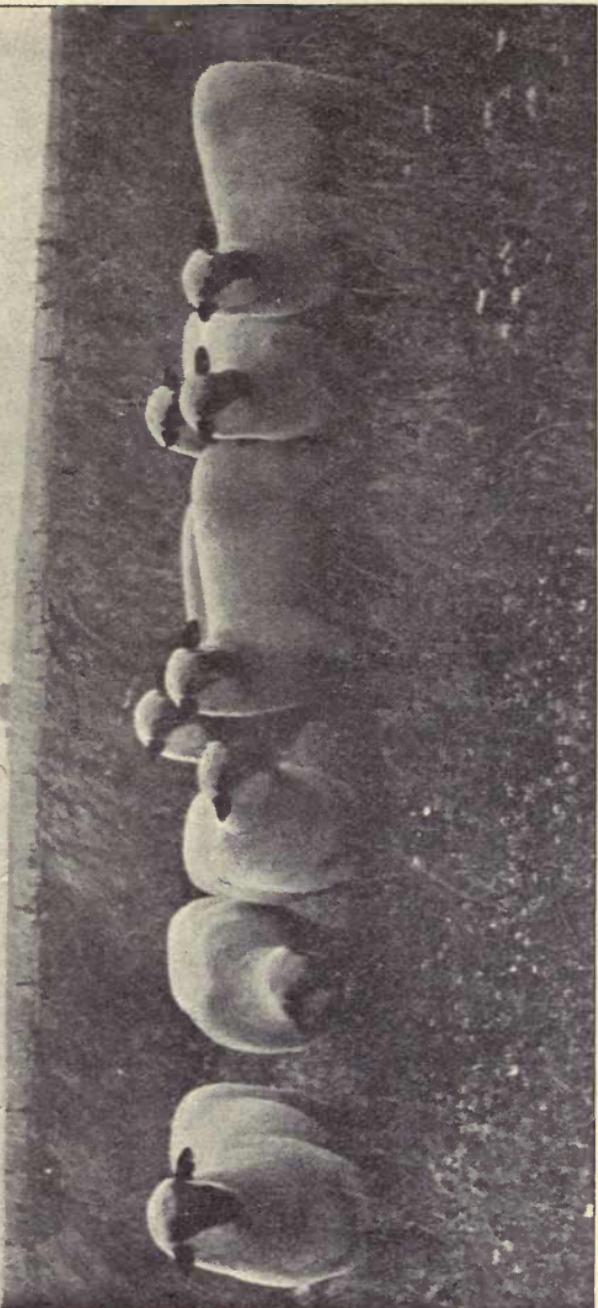
Downs wanted. The cross was repeated again and again, the native prepotency of the old race striving hard for preponderance; but the better bred blood of the improving race in time prevailed, and after many crosses with the Southdown the horns disappeared, the white face was changed to a black one, the frame, loose and angular, was brought by degrees to a compact body, with a broad back, round barrel, short legs, and superior quality of flesh, with a quick feeding habit, and an ability to make the earliest growth and the most salable weight, both of carcass and fleece, for the food consumed. The ancient colossal head with its bulging nose has been changed for one of pleasing proportions, yet strong and indicating a vigorous and hardy nervous constitution. The brain is capacious and the body is evenly molded, deep and broad on the back, wide between the forelegs, and full behind, a model carcass for the butcher, and for the satisfaction of the breeder.

Its hardiness is unquestionable. It is at home on the Southern old field, on the best cultivated farms of the East and West, and away on the Northwestern ranges it sustains itself as a triumph of the breeders' art.

Before the late war between the North and South a lot of this breed had been imported into Virginia, and were flourishing. The misfortunes of the strife tended to scatter the flocks which became distributed over the Southern States. Some black faces found in the N. Carolina mountains were traced back to these Virginia flocks, and the evidences of the value of this breed for crossing on the thin, ill-formed, unprofitable, native sheep, are to be met with in the still black faces of well formed thrifty sheep scattered here and there among the elevated Southern pastures.

This breed is well adapted for improving the small light bodied native ewes. It is commonly thought that to use a large bodied ram on these small light ewes is bad practice, for the alleged reason that the large size of the resulting lamb will endanger the small ewes, and be born with difficulty.

This, as is stated at more length in the chapter on breeding, is not based on scientific principles, or on common sense and experience. For the male merely contributes the vital germ of life to its offspring, with it habit of growth and assim-



HAMPSHIRE DOWN RAM LAMBS, BORN IN 1897.

Owner and breeder, James Flower, Chilmark, Salisbury, England. Winners "Challenge Cup" at the Salisbury Fair, 1897; also 1st Wells County Show, 2nd the Royal, 2nd Royal Counties, 3rd Oxfordshire Society, and 3rd Bath and West Shows.

ilation of food after birth; the ewe gives only the life and its own substance to its offspring, and while the lamb is of the normal size for the ewe, it has the ability of its sire to grow and turn more food than its dam ever could do into growth. There is no good reason therefore why a well bred Hampshire ram should not be used for the improvement of the smallest of our common sheep. Its natural history goes to prove its fitness for this use under certain circumstances, which make its use desirable for this purpose.

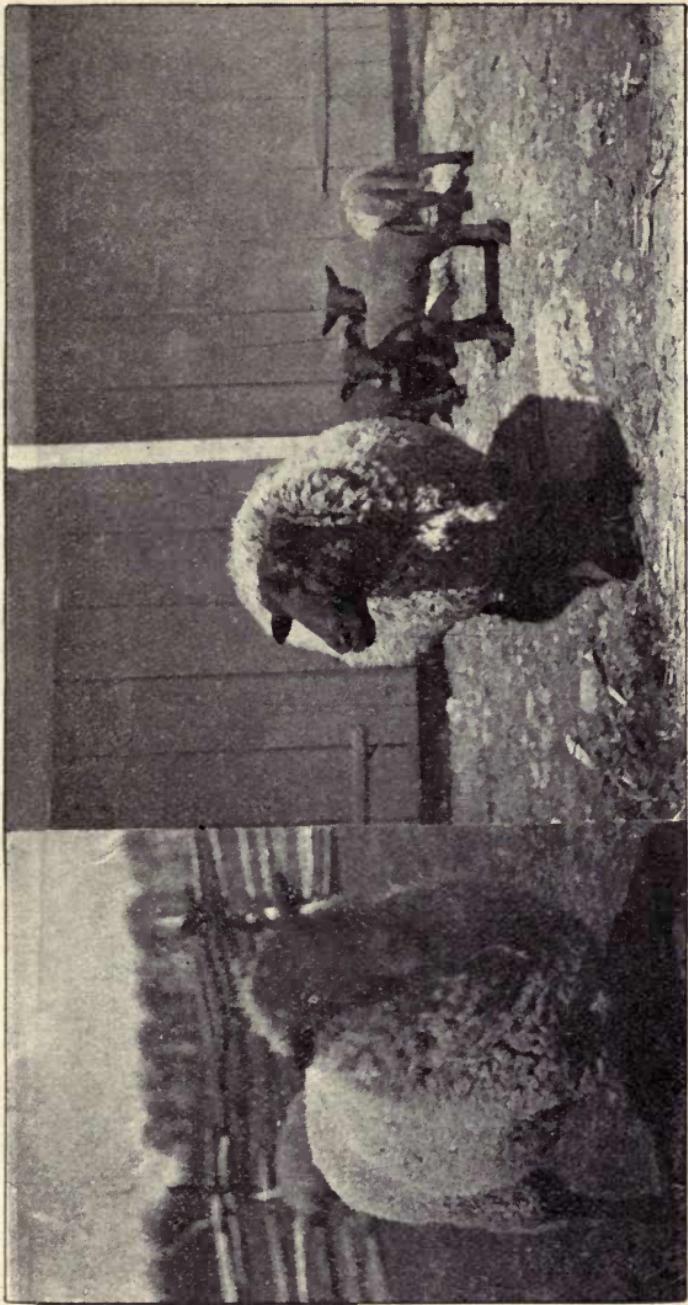
The recognized points of excellence of this breed are its rather massive head with its prominent Roman nose, and the absence of horns or rudiments of them, as slugs, snags or buds. The face and legs are deep black, the fleece is free from all black spots and is close and fine all over the body. The skin is pink under the wool. The ears are somewhat pointed as compared with those of the Southdown, of a dark mouse color behind, and free from light specks or mottling. The forequarters are broad and the breadth of carcass should be maintained down to the rump. As this is one of the most conspicuous faults of the breed, it is to be guarded against in choosing rams for the increase of the pure bred flocks.

THE SUFFOLK.

The Suffolk sheep has only recently come into prominence as a breed. It is only since 1886 that it was given a class at the Royal Agricultural exhibitions, but since that time the breeders have formed an association, and by strong efforts have brought their sheep into notice. This sheep is similar in many respects to the Hampshire, but is not so compact in form, and the short black hair on the face extends over the head which is thus devoid of wool. It is as yet in process of formation as a breed, and has its history to make. It is, as may be seen from the illustration given, a neat, well formed sheep, with a good carcass and something of the Hampshire type about it.

THE OXFORD DOWN.

This sheep is a double cross, being made up of the Hampshire ewe, a distinctly cross bred animal, with the Cotswold ram. It is the largest of this class of sheep, excelling the Hampshire in size at the same age. It is a later



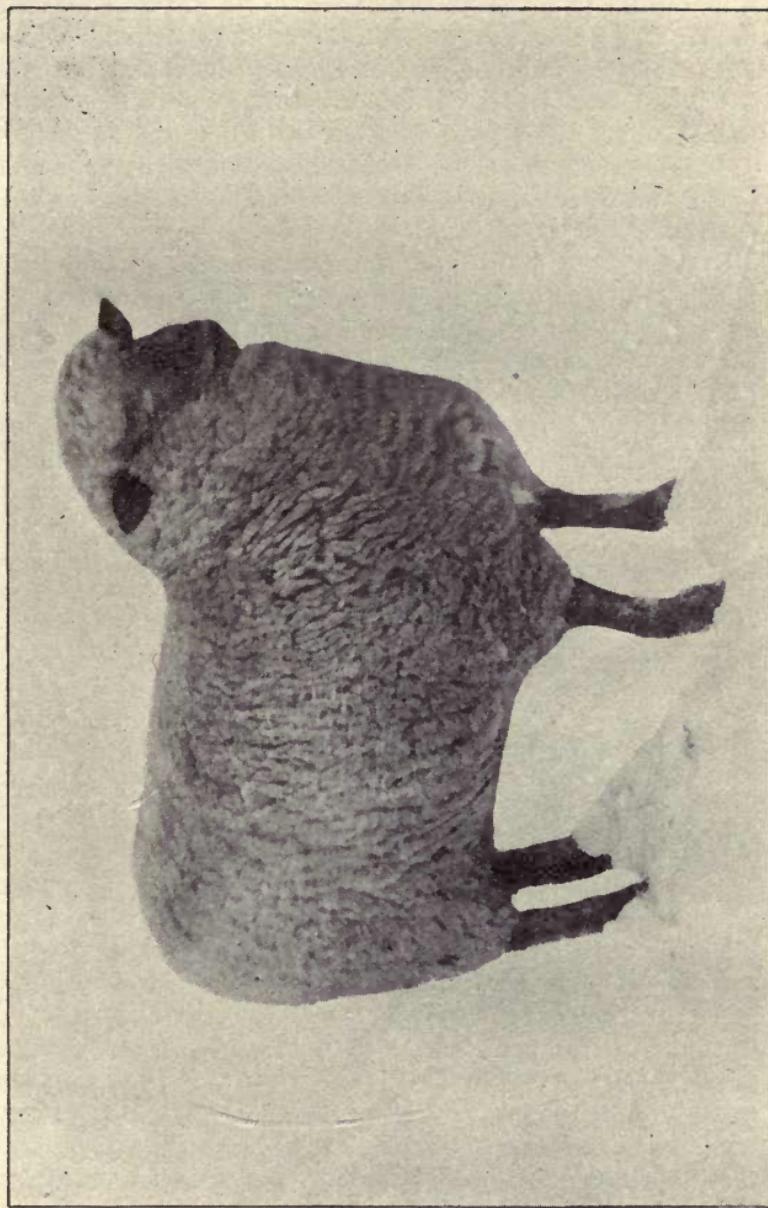
SUFFOLK RAM, EWE AND THREE OF HER LAMBS.
Bred by M. B. Streeter, Brooklyn, N. Y.

sheep to bring lambs, so that generally it suffers undeserved detraction on account of the lighter weight of the lambs at the exhibitions, as compared with the earlier dropped Hampshires. The carcass weighs twenty to twenty-four pounds the quarter at a year or fourteen months old.

This sheep has not so dark a face as the Hampshire, this being somewhat mottled, nor is the shoulder so broad as in the Hampshire. It has not the evenness of its close competitor, showing a less well defined type, and thus needing longer breeding with careful selection of the rams used, as well as of the ewes. Lambs are bred by the English farmers by crossing these ewes with a Hampshire ram, for the purpose of darkening the face, and the reverse cross is used when the face is satisfactory but the form is not. Then a Cotswold ram is used. Sometimes a Shropshire ram is chosen and the result of this cross is a much improved carcass, broad along the back, and with better hind quarters. When well selected rams are used this breed is one of the most profitable for mutton, and as the fleece is an excellent worsted wool and weighs seven pounds on an average, it is a valuable addition to our adopted breeds. It is one of the best farm sheep, although it has a good reputation for range purposes. For this it is not to be thought that it is the purpose of the shepherd to make a flock of this breed; on the other hand the rams of this and other breeds are procured to cross on the common native or grade sheep, and thus produce a high grade whose value is easily doubled by this use of good rams. It is thus a matter for the shepherd to select the rams he may find the most valuable for this use, and the Oxford Down is well worthy of regard for this purpose. The sheep shown in the illustration was the champion of all breeds in the two shear class at the Oxfordshire show of last year.

THE DORSET.

This sheep in its native country goes by the name or class of the Somerset and Dorset Horned breed. Of late years this breed has become exceedingly popular on this continent, mostly however for its special fecundity and early breeding habit. Indeed it is so prolific that two lambing seasons in the year are possible under the right management. It is a white faced sheep with a close short fleece used



THE CHAMPION (1897) OXFORD DOWN RAM LAMB "ROYAL VICTOR."

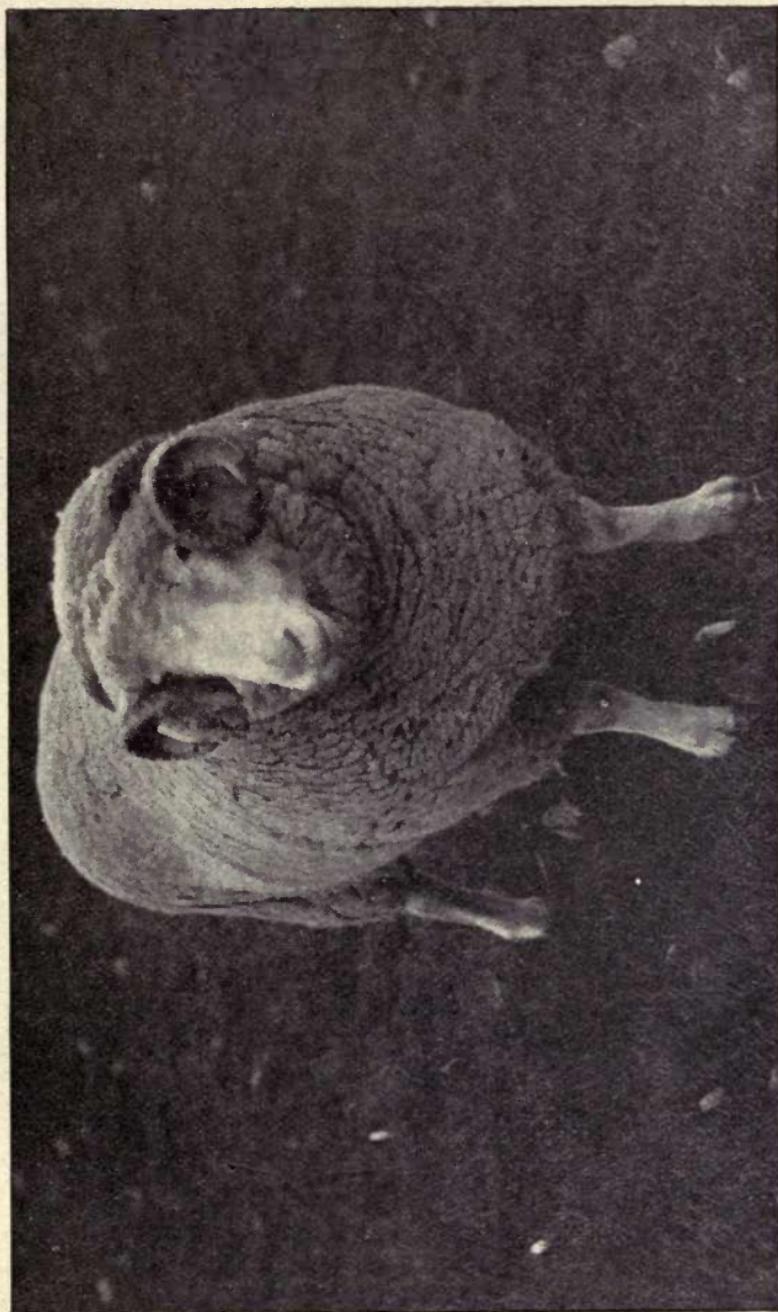
Property B. F. Miller & W. F. Stewart, Flint, Mich.

for flannel goods, and such clothing fabrics as require such a material. It is thus a useful sheep for its wool alone, of which the fleece will weigh four or five pounds. It is a native of the southern part of England in which the mild, delicious climate permits tender plants such as the fuchsia, the heliotrope and the geranium to bloom the whole year round, covering the picturesque cottages with their brilliant bloom, while the northern parts of the country are covered with snow.

It is solidly built, having a broad back and short legs; it has a tuft of wool on its forehead, and ewes are horned as well as the rams. It is one of the most ancient of the English breeds, and has been preserved in its original purity from a remote period. Its breeders claim that it was existing before the Roman invasion, more than two thousand years ago. But of late it has been carefully improved by the selection of the best rams and the diligent search for the most prolific ewes, of whom it is not at all rare that the breeder may obtain four or even five lambs in the year. It is larger than the Southdown and although most esteemed for its prolificacy yet its mutton is above the average of its class of short-wooled sheep. The wethers, under good feeding, reach a dressed weight of twenty pounds the quarter; the forequarters however are apt to be light. They are a hardy sheep and since their introduction here have proved to be well suited to our cold Winters and warm Summers. They have also proved to be well adapted to the ranges, being excellent travelers and rustlers.

Their most prominent characteristic, however, is their unrivalled fecundity. Taking the ram in May they rear lambs ready for the market in the holidays, and breeding again soon after dropping the lambs bring another or other lambs in March or April, and often bringing twins and sometimes triplets, thus increase very fast, besides making a good profit for the lambs sold. It is the usual custom to breed the ewes to a Southdown or Hampshire ram, by which the market lamb has a black face which is generally preferred by the butchers. No other breed of sheep is so prolific as this under skillful management.

The breed is sustained by breeding the ewes to one of their own race for the increase of the flock, and the long



THE AMERICAN DORSET.
Bred by the Tranquillity Farms, Allamuchy, N. J.

experience of the breeders may be taken as a complete contradiction of the naturalist's belief, to the effect, that crossing a pure bred animal outside of its own kind is apt to produce diversion and make the breed impure by the effect of the cross on the character of the ewe. The long peculiar history of the Dorset goes to show that, with sheep certainly, the outcross does in no way vitiate the blood of the females so bred.

The peculiar system of rearing these market or house lambs will be especially noticed in another chapter.

The Somerset sheep is somewhat larger than the Dorset and differs from it in having a pink nose, that of the Dorset being white. The wool is also a little longer, and the lambs are heavier. This breed has however the same special peculiarities, being used for rearing early lambs, which are fatted and often sold with the ewes at the same time.

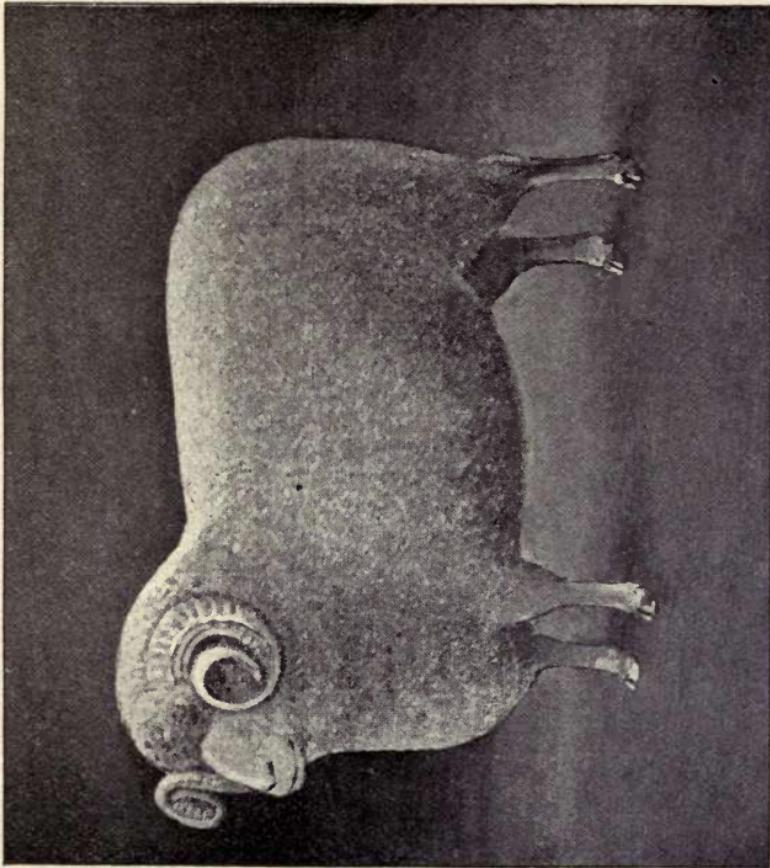
A smaller variety of the Dorset is the Portland sheep, reared on the island of Portland, where not more than a few thousand are kept, principally for their sweet and delicate mutton, which brings a sufficiently high price to pay for rearing this small sheep, which do not weigh over ten or twelve pounds the quarter, when fat and fully matured.

THE LONG-WOOL BREEDS.

The Long-wool sheep are without horns, except in some of the mountain breeds, and one of these is fast losing this unnecessary appendage, once needed doubtless when this defense against the wolves and foxes was indispensable. The most conspicuous of this class of sheep is

THE LINCOLN.

Sheep are especially influenced by their environments. This is clearly proved by the large number of special breeds existing in the small extent of the British Islands, in which there are more sheep, and a greater variety of them, than in any other country in the world as compared with it in area. The English are a mutton eating people, and enjoy an enormous trade in woolen goods, having the great monopoly, as it were, of the world's markets for this invaluable product. This has existed for hundreds of years, nay it is nearly two thousand years since the first woolen factory was in operation in that busy country. Consequently we cannot have a



DORSET HORN RAM "FLOWERS" NO. 42.
Bred by and property of W. R. Flowers, West Stafford, England. An unbeaten Ram—1st as a lamb in 1894,
and 1st as a yearling in 1895 at the Royal, Bath and West of England, Royal Counties and Somerset
Shows.

better example before us of the desirability of a large variety of sheep, whether for mutton, of which we are becoming large and larger consumers every year, or for wool of which we are working up more and more continually.

The Lincoln sheep is a growth of many years' culture in a special district of England known as the Lincolnshire fens, and the adjoining counties of Norfolk and Cambridgeshire. In this district agriculture has been carried on under the highest system, the growth of roots, and the accompanying flocks fed on this crop, having advanced the agricultural methods so conspicuously, that what is known as the Norfolk system is held to be the highest type of farming. Hence it is to be expected that the sheep of this locality should be something beyond the common line.

For centuries there has been a Lincoln breed of sheep which surpassed in size all other breeds. Its fleece also surpassed all others in length of fiber and weight. It was a great coarse animal, the wool swept the ground on which it fed, and an average fleece weighed twelve to fifteen pounds, which a century ago was phenomenal as compared with other breeds. The carcass was very fat inside, and made the then highly esteemed chops—having three fingers of fat on the meat. But, as might be easily thought, this big coarse animal was not a profitable one after the work of Bakewell with his improved Leicesters was about complete. The intelligent breeders of the old Lincolns at once adopted Bakewell's work, and improved their flocks by crossing the New Leicesters on them. Thus the Leicesters took the same place with the Long-wools that was taken by the South-downs among the Short-wools. This crossing has changed the old Lincoln from its former condition of a coarse form, with flat sides and hollow flanks, and big legs and feet, to one of handsome proportions, with finer wool, having good luster, and highly estimated for the worsteds class of goods. Its fleece has long been the material of which the bunting of the national flags of all countries have been manufactured on account of its great strength and its ability to withstand the battle and the breeze. Our own Stars and Stripes have this kind of wool for the raw material, and it is always in demand for braids and other manufactures which call for this special material, long fiber and great strength.



THE AMERICAN LINCOLN.
Property Gibson & Walker, Denfield, Ontario.

The infusion of Leicester blood refined the great coarse animal, but still left its produce the largest sheep in existence, the quarters of which weigh when fully finished for market thirty-seven pounds, and the fleece often twenty-four pounds. These weights are of course above the average, but they go to show what type this sheep is of.

Necessarily such a sheep is fitted for the highest culture of the land, in which root crops take the most important place. In the United States, however, the silo takes the place of the roots, to a large extent, but yet roots and big sheep and heavy fleeces will always go together.

But with our vast ranges we have occasion and space for this grand sheep for crossing on the common natives. This has been done to some extent in suitable circumstances, with much advantage, and when the shepherds will abandon the unwise and wholly wrong belief common among them, that a big ram is not suitable for crossing on little ewes on account of the supposed great size of the lamb thus produced, this breed will be extensively used for this purpose, producing a valuable mutton carcass and a most useful cross-bred wool. It is not, however, a part of wisdom to suppose that this cross, violent as it is, will be the foundation for a new race having the excellencies of the Lincolnshire. This subject, however, is too important to be more than suggested here; it lies at the foundation of the science of breeding, and must be left for consideration hereafter.

This breed is white faced, and has a conspicuous tuft on the forehead, which is the most marked indication of the old blood in it. The head is massive but not coarse, the nose is somewhat arched (Roman) and bare of wool. The brisket is full and deep, the body round and well proportioned, and while it is a heavy sheep it has no coarseness about it. It does not come up to its old weights either of carcass or fleece, but its quality is improved by the refinement it has undergone through many years of continuous careful breeding, making it a desirable sheep for its mutton and wool, and for the improvement of the common flocks.

THE ROMNEY MARSH.

It seems at first thought that a marsh sheep should be a misnomer. But sheep are made for every condition, even



LINCOLN RAM "RIBY GENERAL" 2ND, 1195 (A NOTED STUD RAM).
S., Riby General 367; G. S., 1st Royal Windsor 152; G. G. S., General Gordon. Bred and owned by Henry
Dudding, Riby Grove, Stallingboro, Grimsby, England, the premier breeder of Lincoln sheep in England.

for pasturing on marshes. And thus the Romney Marsh sheep is a habitant of the extensive salt marshes of South-eastern England in the County of Kent. Considering that we have many millions of acres of similar lands on our sea coasts, this breed is by no means to be omitted in this recapitulation. Indeed it has been acclimated and kept with success on the coast lands of New England and New Jersey. It is supposed that the deadly parasite, the fluke, would forbid the keeping of sheep on marsh lands; but this parasite, the cause of the liver rot of sheep, is never found on salt marshes, as its common bearer, in which it passes one stage of its existence, inhabits only fresh water. It is related in form and character to the old Lincoln, being a long wool sheep with a very closely coated fleece. As with the Lincoln it has been greatly modified and improved by infusion of Leicester blood. Like the Lincoln, too, its home is on rich pastures, and it is not uncommon for seven of these sheep, with as many wethers, to be kept on each acre of a pasture. This fact should be well considered by our readers, for fine sheep and a profitable flock must go with full feed, and the farm sheep is always a type of the culture of the land on which it is kept.

By the crossing, it has been reduced in size and improved in form, while its fleece has been refined. It is a white faced breed mostly, having a forelock like the Lincoln, which it much resembles. It is an extremely hairy sheep, being rarely house-fed in the winter, pasturing on the marshes and meadows in all weathers through all the storms of a sea coast exposure. It is thus one of the breeds which may be adopted for range flocks, of which hardiness is a desirable characteristic. It is a profitable sheep for its fine mutton and its fleece, valuable for worsted goods.

THE COTSWOLD.

The Cotswold sheep has an interesting history. It is the oldest breed of sheep of which there is any satisfactory record. Its history goes back for at least three centuries, and beyond that, while it has no written records, yet it has been known that the long wool yielded by this sheep was in high favor long before the name of the sheep which produced it was a matter of notoriety. This long pedigree explains the

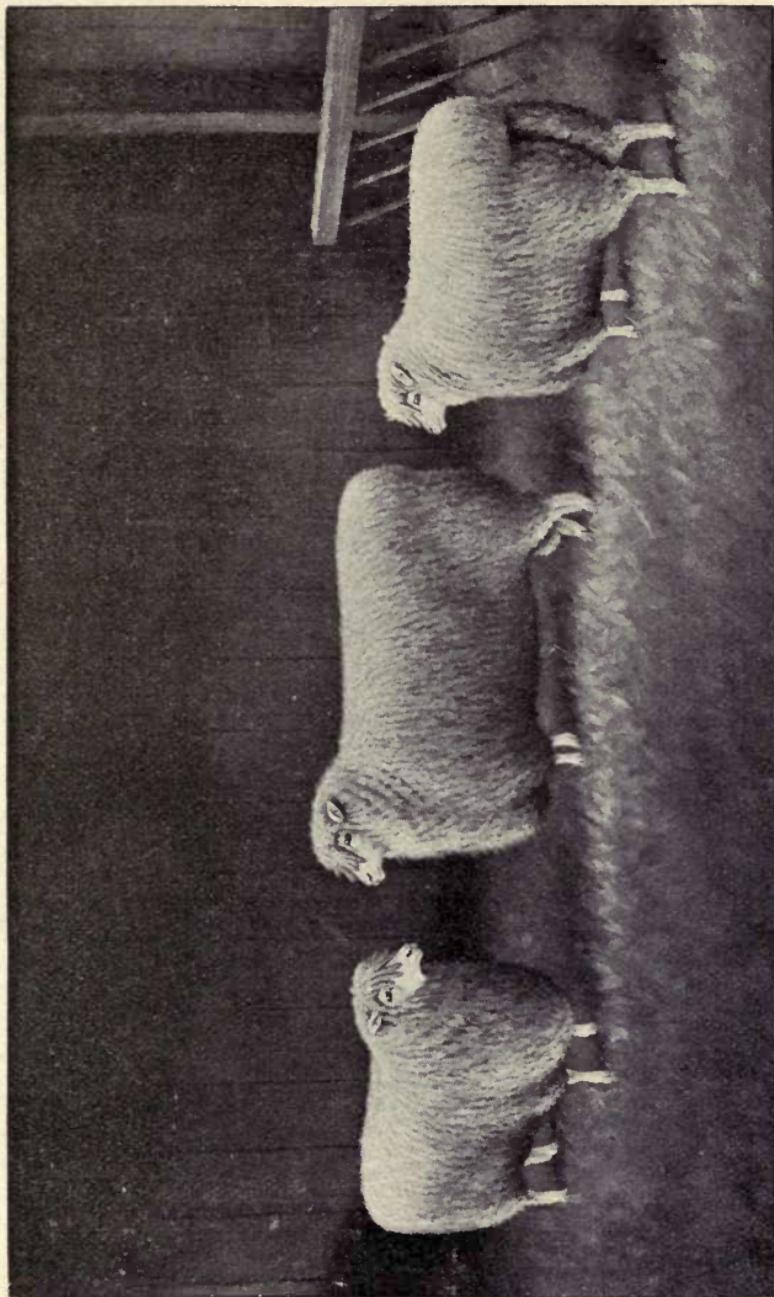


KENT OR ROMNEY MARSH SHEEP "ROYAL DARLINGTON 1ST," 220, VOL. I.

Breeder and owner, W. Millen, Syndale Valley, Faversham, Kent, England. Won 1st Prize at the Royal, Royal Counties and Tunbridge Wells in 1896; 1st Prize and Champion at Royal Counties both in 1896 and 1897; also in 1896 1st and Champion at Tunbridge Wells, and 1st at East Kent Show both in 1896 and 1897.

reason for the great natural prepotency of the rams of this breed in the production of the various crosses which have been made by the Cotswold rams. It is one of the hardiest of all breeds, having been reared for this long period in a poor exposed district, and while it changes character when removed to more favorable surroundings, yet it is one of the hardiest sheep for the range. It is the next largest sheep to the Lincoln. It is a good mutton sheep and has a good fleece of rather coarse wool, valuable for heavy goods. The flesh is not so fine as that of the Down breeds, but is yet excellent for the butchers' use when not over fifteen months old, when it fattens readily and makes twenty-five pounds to the quarter. Its old size has been somewhat reduced, to conform to the present demand for lighter carcasses. The fleece, too, is not so heavy as it used to be, when it often weighed 12 lbs. or over of wool. It has been crossed with advantage with the Leicester, yielding then better mutton and a finer staple of lustrous wool, in good demand for heavy goods, and especially of the coarser kinds of women's dress fabrics. One of the best of its crosses is with the smaller Down breeds. It has been used with much success to cross on the Merino, the lambs of this cross making fine market stock, being large and fat, and the full grown cross breeds making fine market mutton and a useful fleece. Sir J. B. Lawes in his experiments in feeding sheep of various breeds, proved that these sheep made a more profitable return in growth for the food consumed than any other breed. Its hardiness has been proved by its average losses by death or accident being as low as two and a half per cent under ordinary circumstances, under a system of open fielding during the winter. It has been kept mostly on a system of feeding in the open ground on turnips.

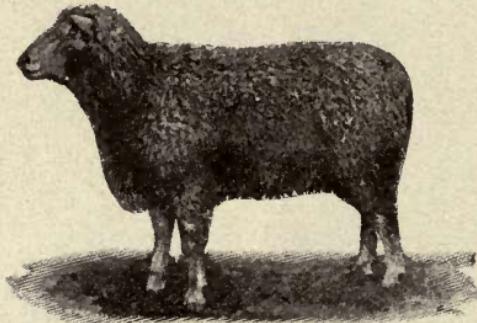
The face of this sheep is mostly white, sometimes with a grayish mottled marking; the cross with the Downs gives a black face with a less pronounced Roman nose, which is however less prominent than in the Lincoln and Leicester. The forehead has a conspicuous tuft of wool. The belly is generally well covered with wool, as is also the scrotum. For crossing on the smaller breeds, especially our common natives, it is not excelled in point of the hardiness of the progeny, the increased size and the weight and value of the fleece.



COTSWOLD SHEEP,
Property Geo. Harding & Son, Waukesha, Wls.

THE WENSLEYDALE.

The Wensleydale breed is the produce of a cross of the Leicester on a Yorkshire breed somewhat similar to the Lincoln. By continued selection it has become a standard breed having special peculiarities, the chief of which is a bluish tinge in the skin and of the face and ears, sometimes extending all over the body, and being more marked on the bare and hairy parts. It is mostly used for its lambs, which are marketed when a year old and the mutton of which is of excellent quality. It is used mostly for crossing with the black-faced breeds, the peculiar tinge of the skin being thought to throw lambs more like the rams, and being larger and of excellent fattening disposition they are found more



WENSLEYDALE RAM, TEN YEARS OLD.

profitable than the smaller pure, black-faces. It is valued for its fleece which has a peculiar curl, called pirls, these being really twists of a corkscrew shape, and which in manufacturing tend to felt in the goods, giving a very firm and tough cloth used for the hardest wear. The fleece is rather open, long in staple, and wastes but little as compared with the fleece of other sheep in the scouring. This peculiarity of the fleece is extended over the whole of the body, including the head and between the eyes and round the ears; the belly is well covered, as well as the scrotum and down the legs, with downy wool. There is a conspicuous absence of hair in the fleece, which is considered as an objectionable feature by the breeders.

The head is of good size, indicating a strong constitution, and is carried high on a strong neck, giving the sheep a



THE AMERICAN CHEVIOT.
As bred by Howard Keim, Ladoga, Indiana.

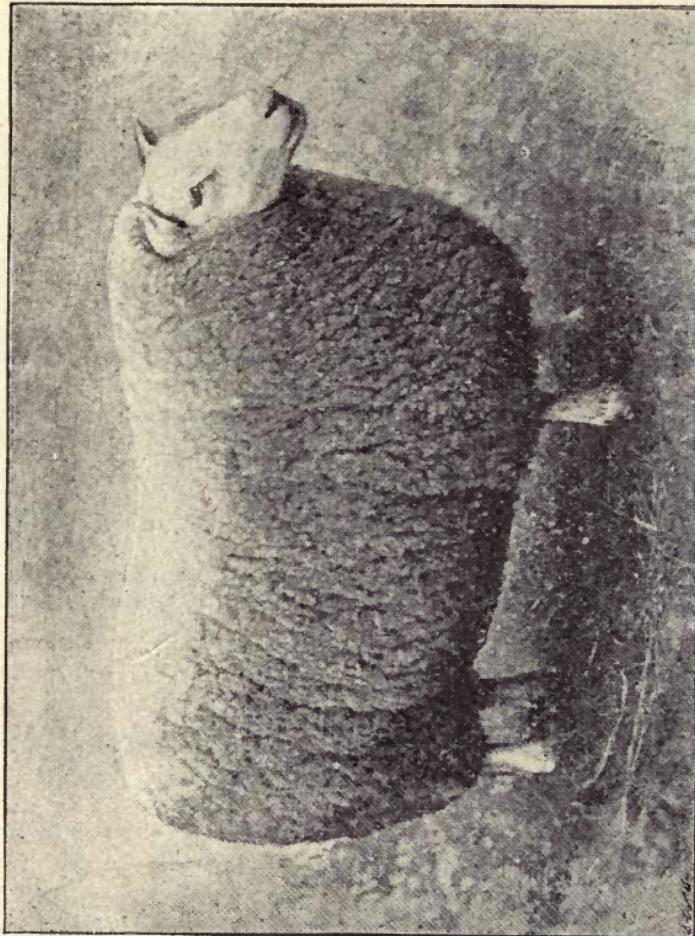
much favored style and an attractive appearance. The nose is wide, the back of the head is flat, the ears are large and prominent. The carcass is noted for its evenness and the absence of patches of fat, the meat being well mingled with fat all through rather than on the outside of the carcass. While it is somewhat slower in maturing and in taking on fat than the Leicester, it is thought to be hardier in constitution, and in its active disposition, being, as we should say, a far better rustler, and thus more able to withstand the ordinary hardships of outdoor winter keeping. It is thus of value for crossing on the common range flocks as well as for open grazing on farms.

THE MOUNTAIN BREEDS.

The Cheviot is the principal breed of this class, and the more interesting to the American shepherd, as it is already introduced on this side of the Atlantic, and has made a place for itself in which it has proved to be a valuable breed for farm use as well as for crossing on our native stock. We have an association of breeders of this sheep who deserve credit for their enterprise in this direction.

It is named from the Cheviot hills, a range of low mountains on the border of England and Scotland, once, on a time, the scenes of continued strife between what might have been called in our parlance border ruffians, who during the old wars between England and Scotland made these noted hills the scenes of midnight forays, by what were then called the cattle lifters. Then every shepherd's house was his castle, in which—always armed—he was prepared to defend his herds and flocks from the invaders from both sides. At the present time these sheep are scattered all over the green hills of Scotland, and with the Black-faced Highland sheep make up the great majority of the flocks. The author takes a deeper interest in this breed, possibly, as he imported some of them some few years ago for his farm in the mountains of North Carolina, where they succeeded admirably, and the cross of this breed on the native sheep of this district is yet apparent in the larger build, finer mutton character, and the largely increased fleece of wool, admirably adapted to the home manufacture of the popular jeans.

The special marks of this breed are the short, hard, pure



THE CHAMPION CHEVIOT AGED RAM OF 1886, "COQUET'S PRIDE." (525 Cheviot Sheep Flock Book.)

Bred by Thomas Robson, Esq., Blindburn, Alwinton, Rothbury, Northumberland, England, Breeder of Pedigree Cheviot Sheep. Rams and Ewes bred on one of the highest and stormiest farms on the Cheviot Hills, the lowest part of which is 1,000 feet above sea-level. This Ram was bred on the above farm.

white hair covering the face, extending over the ears and behind the head; rudimentary horns, which are sometimes loose and mere appendages of the skin, a prominent Roman nose, black nostrils and bright full black eyes. The wool is moderately long, straight and free from kemp (or the short coarse hairs which go by this name), and covers well all parts of the body, the belly, breast, and legs down to the hocks. The tail is naturally long and rough, protecting the udders of the ewes, and not objectionable when the sheep are kept on pasture and not fed on turnips, rape, or other laxative food. The shoulders are high. The ewes are excellent milkers and good mothers, losing few lambs, even when unattended by the shepherd. They are docile and not given to straying, even in the late season when sheep, by long inherited disposition to wander, are most inclined to stray.

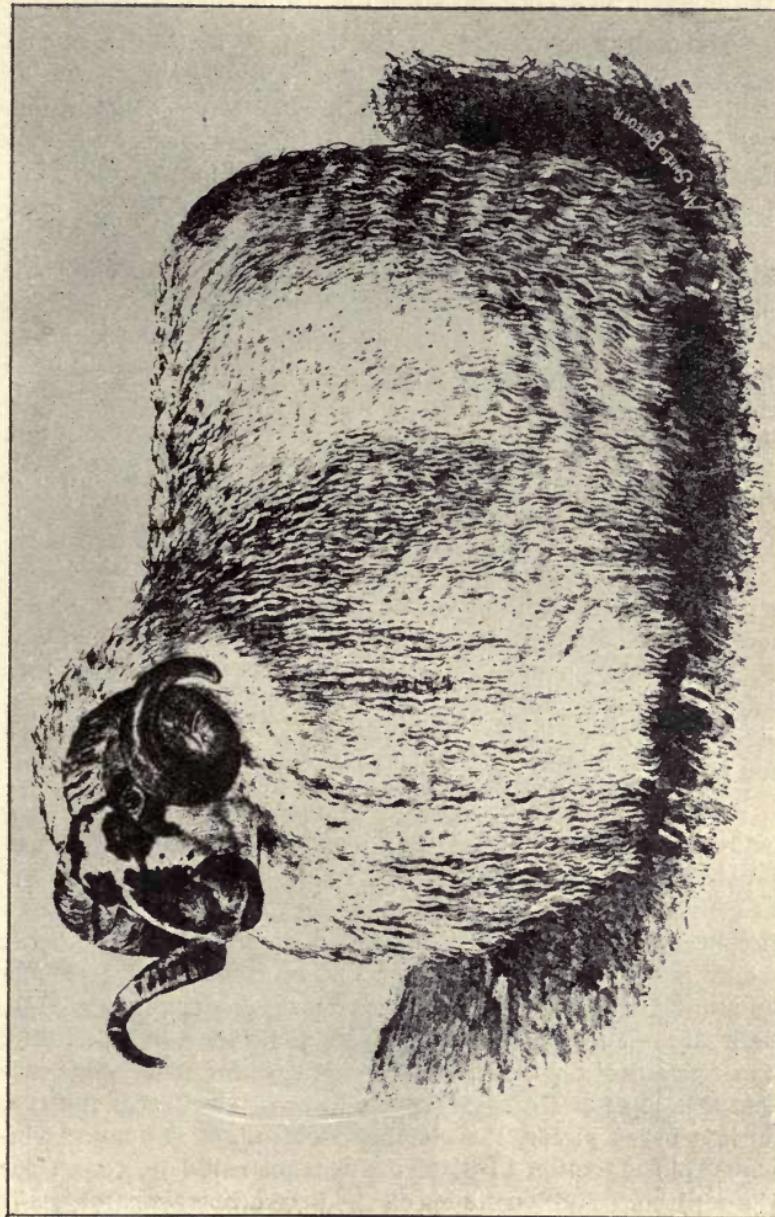
It is the custom with the Cheviot shepherds to cross the ewes with Leicester, Lincoln, or Wensleydale rams; the produce are known as Leicester or half-bred lambs, and are popular in the markets at twelve months old when they will weigh sixteen to eighteen pounds to the quarter. The flesh of these half-breds is not so fat and is better considered by the butchers than that of the pure Leicester.

This breed is kept in the States of New York, Pennsylvania, Indiana, Iowa and North Carolina, and in these widely different and distant localities all do well.

The fleece weighs five to seven pounds in the ewes, and a half more in the rams. The ewes imported by the author weighed 170 lbs, and the ram, two years old, 270 lbs.

THE BLACK-FACED HIGHLAND.

This breed is smaller than the Cheviot, and thrives well on scant pastures, or the rough herbage of mountains. It is originally a forest sheep, having been kept in Ettrick Forest from long time back. It is now the principal sheep of the Scottish Highlands, where it is kept in large flocks, both for its mutton and its fleece. The mutton is of the finest quality, exceeded in this respect by but one other sheep—the small Welsh mountain breed—which furnishes meat of such fine texture and flavor as to be kept for sale mostly in the fancy grocery shops of London and other of the largest English



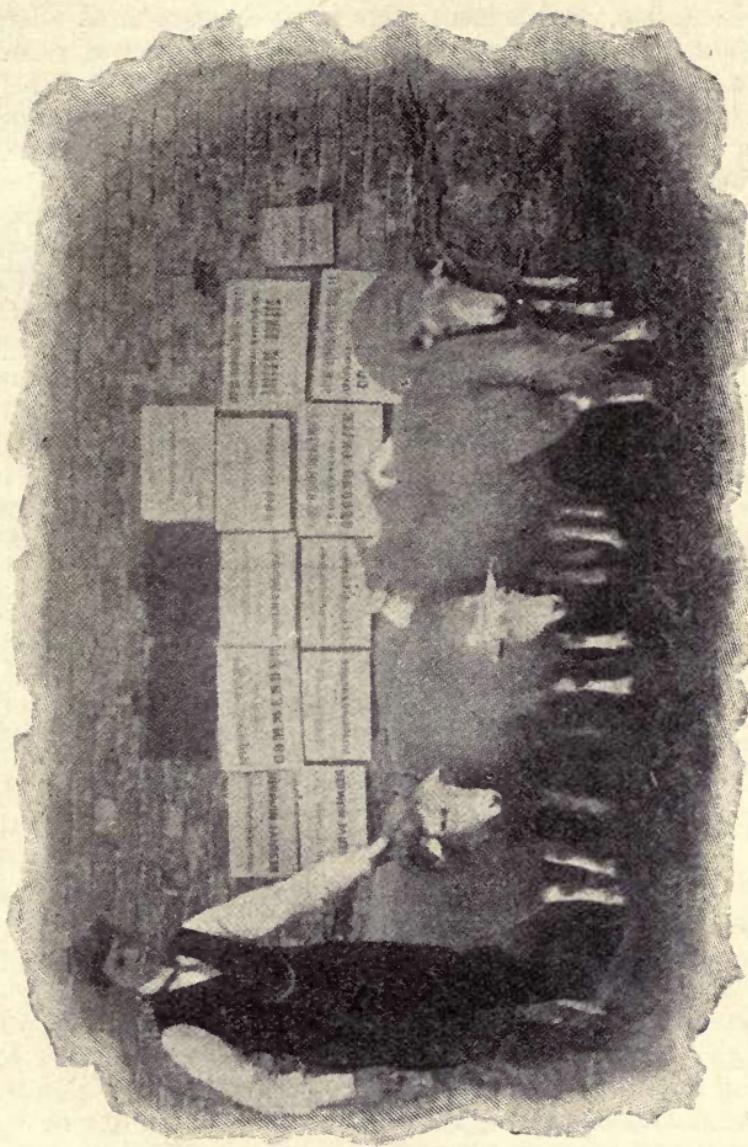
BLACK-FACED HIGHLAND RAM.
Noted Prize Winner.

cities. Its fleece is coarse and weighs only about four to five pounds, being of the class known as carpet wools.

The marks of this sheep are black or mottled face and legs; dun or brown patches are considered objectionable as indication of impure blood and a less hardy constitution. The nose is strong and prominent, but not so much arched as that of the Cheviot; the nostrils are black and wide. The horns of the rams are large and heavy, coming out level with the top of the head, and not joining each other at the base. They have one to two spiral turns as the age may be, the curl being in a forward direction, but not protruding towards the face. The ewe has small thin flattened horns not spirally twisted. The ears are short and small. The back is broad all over from the shoulder to the rump. The tail is naturally short and is not cut. A wether fat from pasture and three years old is considered the finest of all mutton, the quarter weighing 16 to 18 lbs.

Its constitution is exceedingly hardy while on its mountain pastures, where foot rot never occurs; but one fault with this breed is that the wearing down of the hoof on its rocky home has so increased the natural growth of horn that when the sheep is moved to low land farms the foot becomes soft and is addicted to foot rot. This fact should be considered by our shepherds, who might neglect this necessity for paring the hoofs and so lead to disease in the flock.

A few years ago the author found some of these sheep on an Illinois farm, where it seemed at first thought to be as much out of place as a codfish from the ocean. But so far as could be learned the flock had thrived, and if it could so far become acclimated to its new surroundings there, it would certainly be a welcome addition to our stock. On the mountains there is no question of its success, but the coarse, light fleece might stand in the way of its profitable herding. American flocks will scarcely pay to rear for wool alone, unless this is of the highest value, but with valuable mutton, as this breed yields, the cheaper wool might not be any insuperable objection to it, if the market could be found for the mutton. The hardiness of the breed, however, makes it a subject for due consideration as to the value of the breed for crossing.



WELSH MOUNTAIN SHEEP.

THE WELSH MOUNTAIN.

This breed is scarcely worthy of notice were it not for its fine mutton. It is a small, restless, exceedingly active sheep, white-faced, with a carcass yielding a quarter of twelve pounds or less, but of such tenderness of flesh and high agreeable flavor, equal to that of venison, and which brings in the shops of the English cities as much as a dollar a pound at the Christmas holidays, and half as much at other seasons. Its fleece is short but fine, and makes the fine, highly considered Welsh flannels, of which when dyed scarlet the Welsh women make their cloaks. A somewhat ludicrous history is attached to the habit of the Welsh ladies of wearing this kind of outer dress. When the French fleet, about a century ago, landed some soldiers to make a raid on the Welsh coast, the ladies were curious to get a view of the hostile strangers, and a crowd of them standing on a hill were seen by the enemy, who thought them a detachment of soldiers of the English army in their usual red coats. The enemy at once fled back to their ships and hastened home, supposing their intended raid had been made known.

This sheep is an example of the very certain fact that the tenderness and flavor of the food gives the high flavor to the meat, a fact which is not believed by some, but which is certainly supported by similar evidence other than this, and is illustrated in the clearest manner to the expert shepherd, who knows how the pastures make the mutton as well as differentiate the character of the sheep.

THE LEICESTER.

There is somewhat of a misunderstanding to-day as to what the Leicester breed really is. There was an old Leicester breed existing, which was a large coarse sheep with a heavy fleece and a fairly good disposition to feed and fatten, which a noted breeder of the name of Bakewell, who was interested in breeding the Shorthorn cattle, took up, and began a course of improvement by which his name has become famous among sheep breeders. He in course of time made of it what was known as the Dishley (from the name of Mr. Bakewell's home) or the new Leicester breed. The effect of Mr. Bakewell's efforts in this direction was to produce the most profitable sheep of the time, a masterpiece of

breeding, and of skill in selection of materials first. The new breed was marked by early maturity, a great disposition to fatten, a carcass which, for its reduced size, had greater value than the previously larger but coarser animal; a corresponding diminution of offal; and the largest return for the food consumed than that of any other existing breed of sheep.

Mr. Bakewell made a profound secret of his methods of procedure, and although well watched by those interested in knowing his secret, so successfully guarded it that to this day very little is known of it. One thing, going to show the extent of his experiments, was discovered by one of his competitors in former work in improving the Shorthorn cattle, which was that Mr. Bakewell had a remarkably fine black ram in his stables, which was supposed to have been used in this improvement of his favorite sheep, and it is to this ram that is attributed the occasional black spots which are sometimes still found on the best bred Leicesters. Indeed this mark is thought to be an indication of strict purity in the sheep that have descended from the original flock of Bakewell.

It was well known that Mr. Bakewell was not particular as to the means he used so that the result suited his purpose. It is known that the best specimens of the old breed were secured as the foundation for his work, and that while the results were far beyond what might have been expected, yet they were sufficient to establish a remarkable improvement in the old breed and make of the new breed the best sheep then existing.

It had its faults, however. These were want of constitution, sterility, and inferiority of fleece. These have been amended by Mr. Bakewell's successors in the same line, by most careful selection of rams closely bred from the most satisfactory specimens of the improved flocks. And while, as the case now stands, there has been no breed of long wools that has not been improved by a cross of the new Leicesters, yet this breed with its most excellent qualifications has nothing to gain outside of itself, and have only been retained by preserving this breed pure and unmixed.

The special points of the Leicester are as follows:

The head is hornless, long, small, tapering to the muzzle,

and carried high, projecting forwards horizontally. The eyes are prominent, with a quiet, docile expression. The ears are thin, rather long, and directed backwards. The neck is full and broad at the chest, gradually tapering to the head, and fine at the junction with the head. The back forms a horizontal line from the rump to the head. The breast is broad and full. The shoulders broad and round, without any uneven or angular formation anywhere. The forearm is fleshy down to the knee, the bones are small, the legs standing far apart, no loose skin is visible on them, and are mostly bare of wool. The chest is deep, the barrel round, the ribs spring well arched from the back, and the carcass diminishes evenly from the rump forwards. The pelt is thin, soft, and elastic, and covered with a good quantity of fine white wool, finer in fiber than any other of the long wool breeds. Every one of these fine points in a sheep of surpassing excellence, it is known, was a subject of study by Mr. Bakewell, and was carried through by the choice of any material that offered itself to this great master of breeding.

Later breeders have followed in these lines, with the result that the modern Leicester is a model sheep, a subject for the naturalist and artist to admire, and for the shepherd to make his money out of. This has been used in the refinement of almost every other modern breed, but still something is left for the modern breeder to study over and endeavor to improve.

These are a certain delicacy of constitution, want of sufficient hardiness to withstand exposure, inferior ability to nurse the lambs. There are, however, many modern breeders of these sheep who have understood this fact, and their efforts are constantly directed to improve on these points, with so far substantial success.

The chief value of the breed doubtless lies in the ability to improve others on which the rams are crossed, and the grades of it are quite doubled in value by the first cross. It is the great value of the pure breeds like this to improve inferior sheep, and thus the special breeder is able to perform an invaluable service in affording the opportunities to the ordinary shepherd. This indeed applies to every pure breed of sheep, and on account of the vast labor and the con-

summate skill needed to breed such sheep as this, the shepherd will never be able to dispense with the services of the professional breeder. Of course the grades are the great source of supply of sheep for market and for wool, and these depend on the infusion of pure blood supplied by the professional breeders through their fine rams.

THE BORDER LEICESTER.

We sometimes hear or read of the Border Leicesters, and some are at a loss to know what kind of sheep this may be. It is at the present time so closely related and similar to the Leicester that it is recognized as such, and no distinction is made as to the special points of each of the two. It is now a class of this breed which is larger in size, not so refined in form, has a somewhat longer and not so fine a fleece. It was formed through a Cotswold cross on the improved Leicesters of Bakewell. It is regarded by some breeders as the finest of this breed, and is preferred for crossing on the common mixed varieties of the common sheep, when size and weight of fleece are desired. Of this cross it is common to rear lambs which make twenty to twenty-five pounds to the quarter at fifteen months old and after good feeding.

OTHER VARIETIES OF SHEEP.

Spain has about thirty million sheep of which the most are Merinos. There the ancient fashion of migrating twice a year from the low pastures in the Spring to the mountain ranges in the Fall still exists. This habit is controlled by special laws by which the sheep have a right of way on the public roads in preference to other travelers, and a right of free pasture on the roadsides for two hundred feet on each hand. The herds move under the strict discipline of a leader known as a mayoral, under whose charge there are ten thousand sheep in the drove. The drove is divided into sections of one thousand sheep, over which a capitaz takes charge. A requisite number of shepherds and dogs accompany the drove and stay with the sheep until the season closes, when the flocks are returned to their former ranges. The shepherds are much like those of the French Llandes, wearing jackets of raw sheepskin with the wool outside and raw-hide breeches. The jackets are mere skins without sleeves and wrapped around the body.

Spain exports annually about nine million pounds of wool. It is a matter of history that countries which export wool are proportionately deficient in civilization, as may be easily thought when we realize the fact that we import about as much as our whole product, and France imports a large quantity to supply its population with the necessities of a high civilization.

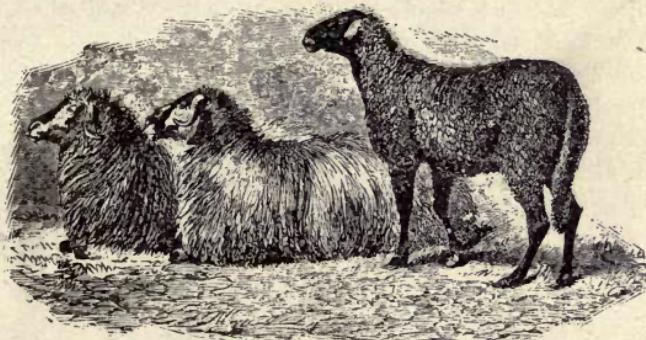


SHEEP OF THE PYRENEES.

Germany has twenty-eight million sheep, some parts of it exceeding the average number per square mile existing in Great Britain, viz., three hundred. It imports a large quantity of wool for its extensive manufactures. The system of herding sheep on the poor land only has the effect of seriously curtailing the value of this interest, and the native grown wool is of the inferior qualities. But many of the rich land owners possess valuable flocks, especially of the small breeds of Merinos whose fleeces are exceedingly fine but of light weight.

Italy still preserves the ancient fashion of migratory flocks; the sheep so kept are of the Merino variety, of which the largest number make up a majority of the seven million possessed by this nation. In the mountains there are a

large number of sheep having black faces much similar to the flocks of the Scotch Highlands. In Piedmont a race of sheep is kept for the milk. These sheep have hanging ears, a high arched nose, long bare legs, and bodies with scant



GIBRALTER AND EAST INDIAN SHEEP.

fleeces. Darwin considered the pendant ears of these and other similar races as a mark of long domestication, as it prevails among the oldest established breeds in those countries in which no modern improvement has been made. The illustration here given of a race of East Indian sheep which is wholly black, and of a pair of sheep from Gibraltar in the



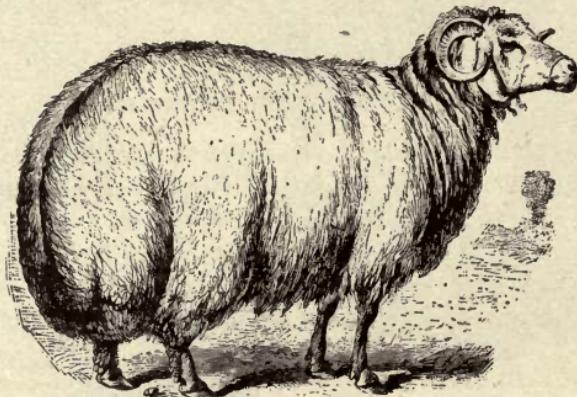
THIBET SHEEP

southwest corner of Spain, shows the prevalence in these of the drooping ears. The same is shown by the Thibet sheep.

A curiosity among sheep is the fat-tailed sheep of Angola, and some localities in Asia. The tail consists of a curious lump of fat on an elongated tail containing as many as twenty vertebrae. The tail being considered as a delicacy, is

generally carefully guarded against injury by being supplied with a sort of truck which is drawn about by the animal as it moves. A sheep of this kind bred in Astrachan has black fine frizzled wool, and the skins are highly valued as a fur for the ornament of cloaks and especially for the collars, and a strip down each side of the front and for the cuffs.

The Tunis sheep has been introduced here from its African home, and like all other immigrants is standing on its merits as a valuable acquisition to our varieties. For some time it strove with its new surroundings, on the quite different conditions here from which it had been used to in its native African home, where it was a habitant of the moun-

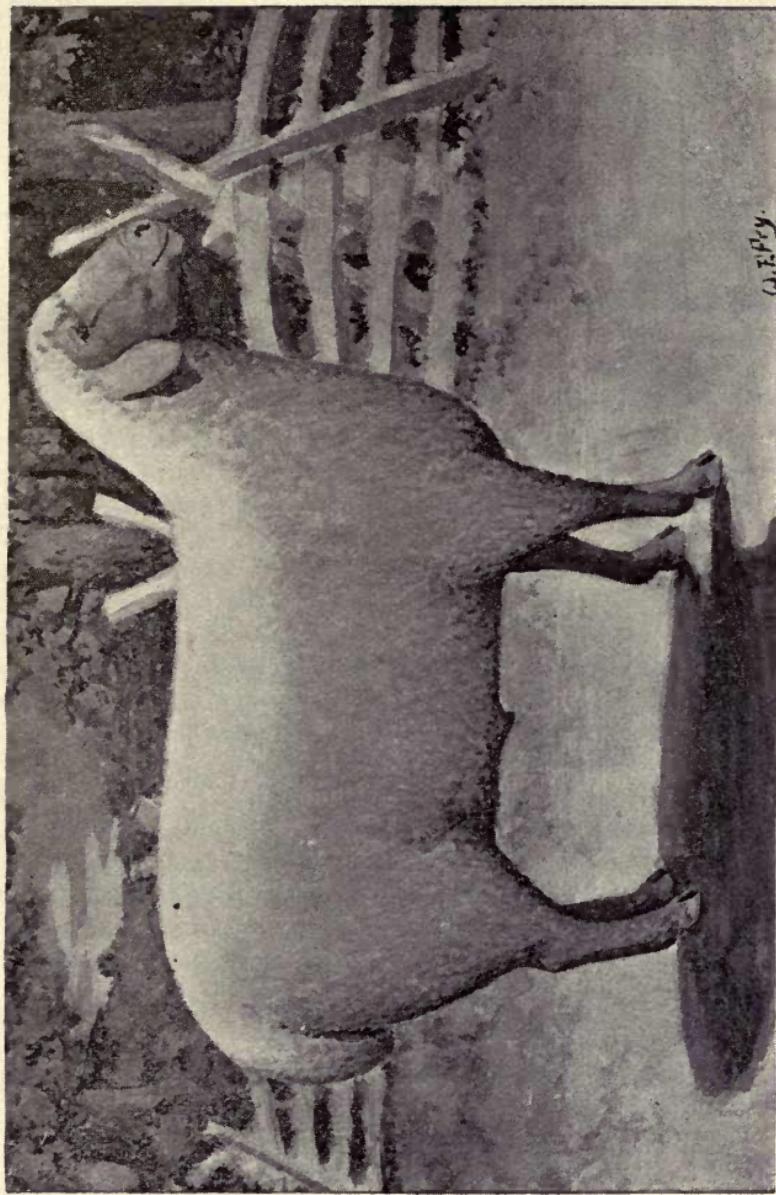


FAT TAIL SHEEP.

tain districts of that part of the dark continent lying to the East of Algeria. Thus Mr. Randall—generally well informed—made the mistake of asserting that this sheep had become extinct, the fact being that its hardy constitution enabled it to overcome difficulties of acclimatation, and it still remains as one of our adopted races and is especially now an American sheep.

Its origin is kindly described by Mr. Rountree, of Indiana, who is now the owner of the largest flock in the United States. Mr. Rountree gives the following particulars of the American history of this breed:

"It was introduced here by General Eaton, our Consul at Tunis, who procured a small flock from the Bey and shipped them to Pennsylvania where they came under the care of Judge Peters of Belmont, near Philadelphia. The



TUNIS RAM.
Bred by Chas. Rountree, Yountsville, Ind.

sole survivors of the voyage—one pair—became the progenitors of a fine flock of pure blood, the last lamb being brought by a ewe of the age of sixteen years, when the only original pair fell victims to a prowling cur. Mr. Peters bred these sheep for twenty years, during which time several flocks were sent to Virginia, Georgia, and the Carolinas, where they were bred with much success until the war of 1861, when, with other fine flocks in the South, these sheep were practically exterminated, a small remnant only being preserved pure. These few sheep, however, increased in number and specimens of them were exhibited at the World's Fair at Chicago, in 1893. A Mr. Guilliams, of Indiana, purchased four of them from the breeder at Columbia, S. C., and is now breeding them successfully. Mr. Rountree on seeing these sheep went to South Carolina and found only twenty-five of them in existence. Of these he procured ten, and has, as the descendants of these, the largest pure flock in America.

"These sheep are noted for their early maturity, their prolificacy (rearing two sets of lambs in the year), and yielding a fine and long staple of wool. The cross of the rams on our mutton breeds yields an improved fleece and excellent mutton. The mutton of the pure sheep has always been noted for its fine quality, and thus the cross-bred produce is valuable on this account, as well as for the fleece.

"The ewes are good mothers, the lambs have been made to weigh seventy pounds at the age of eighty days. This breed is hardy and of sound constitution, the rams weigh when mature two hundred pounds and the ewes up to a hundred and sixty. The cross of the Tunis and Merino makes an excellent sheep for every purpose. An association of breeders has been organized, with its headquarters at Fincastle, Ind., and a herd book is regularly published."

OTHER WOOL BEARING ANIMALS THAN SHEEP.

Wool is not the sole product of sheep only. There are several related species of the genus, which may be included in the list of wool bearers, the fleeces of which coming into competition with the sheep, are of interest to the shepherd. Of these related species of this genus of the Camelidae, there are the Llama, the Vicuna, the Guanaco, and the Alpaca, all natives of the high mountain region of South

America, in Bolivia and Peru mostly; and some of the goats, especially that known as the Cashmere which is noted for its exquisitely fine and soft wool, and the Angora equally noted for its long silky fleece.

The Alpaca became noted some years ago through the enterprise of Mr. Titus Salt, afterwards made Knight under the title of Sir Titus, by the Queen of England, in recognition and reward for his public service in inaugurating a valuable industry in the manufacture of the hair or wool of the Alpaca. This gave rise to a considerable manufacturing town in Yorkshire, England, where the chief manufacturing industry is based on wool, of which the population at once sprang to several thousand on the establishment of Saltaire, as the town of Mr. Salt's creation was well named.

This animal has been introduced into various countries with the intention to acclimate it, but in every instance these attempts have failed. A few of them were carried into Australia, but—as might be easily thought—with disastrous failure on account of the exceedingly different climate and general environments. The dry climate of that country being so different from the elevated locality to which this animal is naturally suited, it might have been a foregone conclusion that the attempt would be a failure. It has been introduced into France with the same negative result, and the only specimens living, in any foreign country, are those kept in collections of wild animals under special care and culture. Doubtless it might be different in our Pacific coast districts, and the newer states and territories on the Southwest, where there are elevated ranges and a similar climate more in accordance with the natural habits of this animal.

This of course applies to the other races of this interesting genus, the only related species existing in the world. Doubtless there is a profitable field for enterprise in the attempt to naturalize all these members of this race of most useful animals, valuable as beasts of burden, as is its relative the camel, well called the ship of the desert. For this race is used to a dry climate, and has been used for packing ores from the mines near the tops of the Andes over the roughest roads, quite impassable for other beasts, and is able to carry loads of 150 to 200 lbs. with ease. As well as

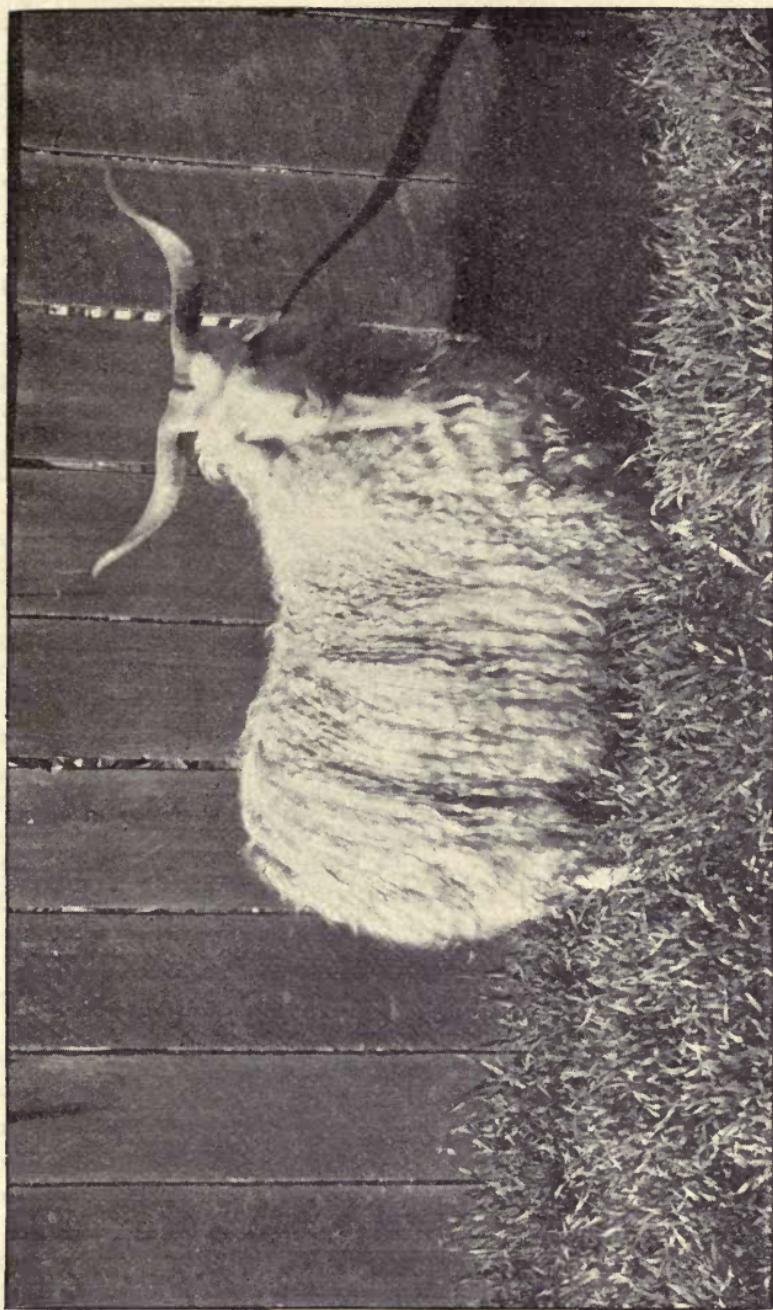
for this use it affords a valuable fleece, and its flesh is a very desirable addition to our usual bill of fare.

THE GOAT.

Another animal, or rather race of animals, closely allied to the sheep, is its congener the goat. This tribe is separated into two distinct classes, the short haired and the long haired. Like the sheep the goat is valued for its fleece, and for its flesh and milk. Its milk is the richest of all animals except the whale (which is not a fish but one of the varieties of the mammalia, or milk giving animals). The whale's milk has far more fat in it than that of any other animal, this being about seventeen to eighteen per cent; the milk of the goat has five to seven per cent of pure fat in it, and is thus highly valued for medical purposes, especially as a diet for consumptives. But it is as a wool bearer that we have to consider it in these pages. The finest wool in the world is the under fleece of the Cashmere goat, renowned as the producer of that costly staple of which the most highly valued shawls in the world are made. This animal is a native of Asia, and is reared mostly in Persia, and especially in the Province of Cashmere, although most of the highly valued shawls are not made in that special locality. This valuable part of the fleece is the undergrowth, which is not sheared, but naturally falls off in the spring and is combed out of the upper fleece when it is loosening at its annual period. This wool is exquisitely soft, fine, and silky, having the elasticity of down. The yearly product is quite small, a full grown animal yielding only a few ounces of the best quality of the wool.

So far it has never been thought worthy of culture outside of its native locality, and as it is only profitable for the special purpose of this quite insignificant manufacture, it is scarcely probable that this goat will be worthy of attention here.

The Angora goat, however, is of a different character, and has already been adopted as one of our wool or fleece bearing animals. It is a native of one of the Turkish Provinces, and being the basis of a profitable trade it is jealously guarded, and its exportation is forbidden except under special permits by the Government. At one time the demand



ANGORA GOAT.
Bred by C. P. Bailey, San Jose, Cal.

for these goats was so brisk that the market value of a ram was twelve hundred dollars, and a ewe brought five hundred. The valuable part of its fleece is the outer coat of fine long silky hair, generally of a pure white, but sometimes a light gray. The fleece weighs on an average under eight pounds but as it has no yolk and loses little in its preparation for manufacture, this weight, at the ordinary current prices, is far more profitable than those of the wool of the sheep. Fifteen pounds is the largest weight of fleece reported, this being sheared from an aged ram.

The staple has an average length of ten to twelve inches for the rams, and eight for the ewes, these bearing a much finer and more lustrous wool. There has been much misunderstanding in regard to this and the above named animal, both being included in the common reports made and published a few years ago under the single name of the Cashmere, which, as will be readily perceived from the entire difference between the two, is a distinct misnomer. So that these reports are entirely untrustworthy as regards the high value as alleged of the Angora fleece. Some of these reports stating the value to be six or more dollars a pound for the raw fleece, and the weight of the fleece as ten pounds or more, it is easily perceived how the public may have been deceived into paying exorbitant prices for these animals, and explains the costly disappointments which arose from the deception. These of course at once threw a deep dark cloud over this really valuable animal, and it soon became an object of quite undeserved disrespect. Animals that had been purchased for five hundred dollars were quickly sacrificed for a mere trifle, and indeed some were given away, as the easiest method of ridding the unfortunate owners of them.

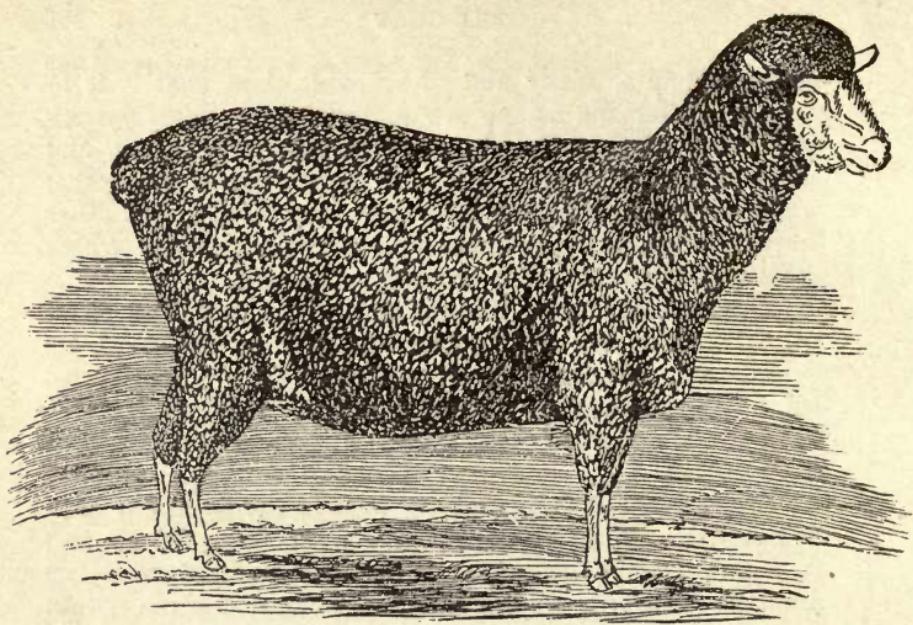
But more correct information being gained, the goat soon found a place among our wool bearers, and has since that early time been reared with much profit in large flocks, especially on our Western borders, mostly in California, where one of the adjacent islands became a most suitable home for a large flock. It is to be noted that the sheared fleece is not the only source of profit, for the skins are largely used for rugs, for carriages and domestic uses, and are in constantly good demand for these purposes. The fleece,

however, has so many and so valuable uses, that it is in permanent demand as the raw material for a great variety of fabrics, such as shawls, camlets, mohairs, poplins, and other valued dress goods, the direct product of the fleece; while the staple is mixed with wool, cotton, silk, and other materials, imparting a luster and strength to these which greatly adds to the value of the goat's fleece.

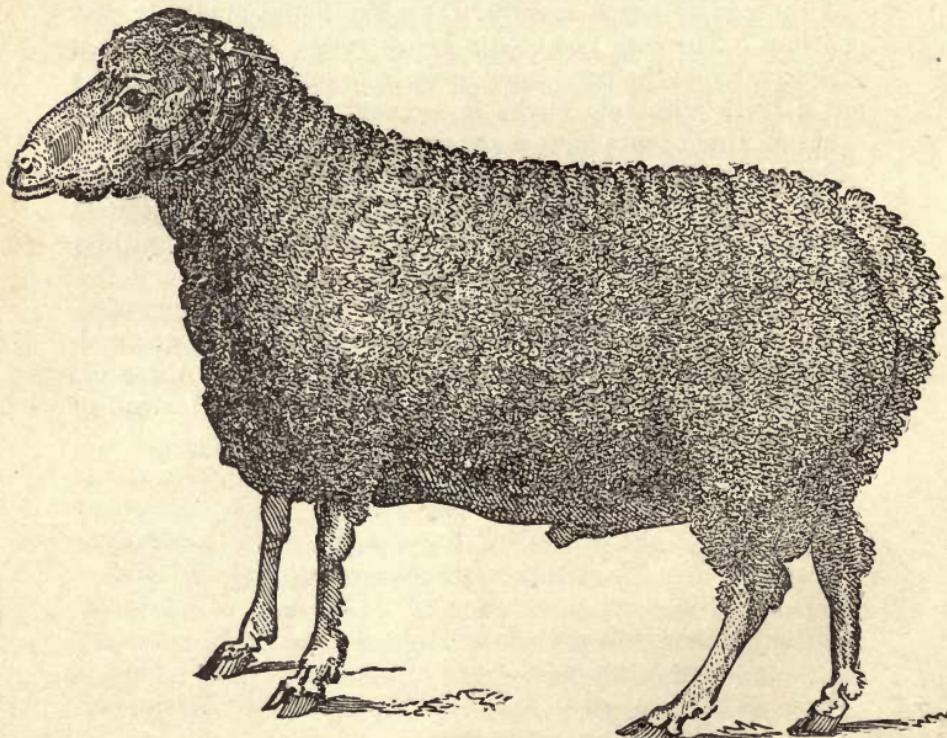
This animal is more like the sheep than any other of its tribe, being mostly distinguished from it by its beard, its lopped ears, and the distinctly different form of the horns. Its tail is generally carried erect and on the whole the carriage of the animal is more upright and vivacious than that of the sheep.

Large flocks of this goat are kept in the Southern English settlements in Africa, mostly in the Cape Colony and in Natal, from whence many million pounds of wool are annually exported. It breeds at an early age, often within the first year, and the males have been known to serve ewes at the age of seven months, the ewes being similarly precocious. The ewe frequently bears twins, and quite often triplets, while the more aged ewes have produced four lambs at a birth with two births in a year. The common belief that all these goats have a strong unpleasant scent, is a popular error—the male only being so distinguished—and this only at certain times of the year. The kids make excellent "lamb," and indeed those of all the goat tribe are frequently sold as lambs in the ordinary markets.

Turkey formerly enjoyed the monopoly of the manufacture of these fleeces, but the inevitably successful competition of civilized nations has almost exterminated these old manufactures, and the fleeces are now exported, instead of the finished product of them.



INFANTADO EWE, OLD STYLE.



SPANISH MERINO RAM, IMPORTED AT COMMENCEMENT 19th CENTURY.

CHAPTER III.

THE SCIENCE AND ART OF BREEDING.

Breeding of any of our domestic animals is an art based on strictly scientific principles. It may be thought that it is an art only, and the mere exercise of the results of experience, without any thought of the principles involved in the reproduction of the animals under the control of mankind. But in truth it is the application of experience to any skilled purpose first studying the reasons why this or that result should be so, that all scientific knowledge consists. This word, science, is not generally understood as to its strict meaning. It is derived from *scio* (a Latin word), meaning to know. So that we may say in short, that science is merely accurate knowledge. It is not in any sense or in fact, suppositions or beliefs; but the knowledge of the actual and accurate reasons why things are thus or so, and this knowledge applied to the common practice of human life and work, always brings results precisely the same under like conditions. That the results reached by breeders of the domestic animals, or in the culture of plants, which possess a strict analogy with animals being sometimes disappointing and fruitless, so far as expectations go, is by no means any contradiction of these facts, but simply due to the imperfect knowledge possessed by breeders of the materials they are working with. And every mistake, or unexpected result, only goes to add to the stock of accurate knowledge which is the essence and fundamental principle of science.

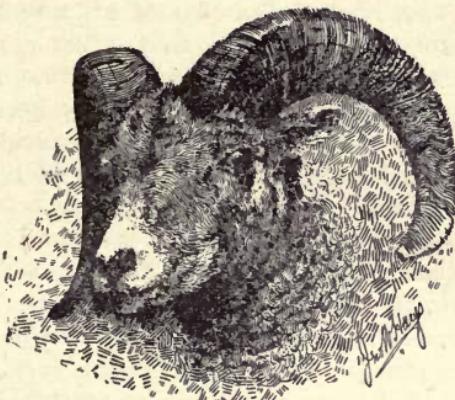
Science is the accumulated results of work, experiment, and experience. Everything, less or more than this, is mere theory; and this is one of the materials which the scientific student works with, in the course of experiment and practical application of the knowledge gained inch by inch, as it were, until some exact results are reached, and these then become really scientific principles.

Understanding this, we are then prepared to study the history and the principles, as far as these have been accurately determined, of the breeding of sheep.

What is a breed? Some think it is nothing more or less than a distinct variety of any of the domesticated animals, differentiated from all others by certain marks and types, which are accurately reproduced by the animals so specially different from all others than their own ancestors and progeny. In short it is a class of animals which reproduce their kind with a certain degree of similarity in the most important features. Thus, those believing this to be the true meaning of the term breed, do not include among the breeds any of the wild animals, and only the domesticated kinds. Without discussing this questionable point, we only here remark that our understanding of the matter is, that any distinct class of animals existing, whether wild or domesticated, that reproduces itself with exactness of form, color, or habit of life, is a breed. For, where have we among our domestic animals, any that exhibit the distinctive habit of a breed, better or more strictly than the wild animals—the buffalo, or the antelope, or the deer, or the various wild birds; or what race of sheep retains its constant form and habits more exactly than the wild big-horn, or those other races of undomesticated sheep of which it is the belief of every scientific naturalist our modern breeds are the progeny. And these habits and special peculiarities every breeder of sheep considers and understands; and works under this principle of perpetuating these characteristics in his flocks.

When the first shepherd undertook to reclaim the wild race, and subject them to his use for the valued skins, or fleece, or the meat for his food, we may be sure he began by selecting those which came nearest his idea of the greatest usefulness. Thus the improvement of the sheep dates back to the remotest antiquity, long before there are any historic records, and the first knowledge we have of the results of this selection and special variation by breeding, based on this selection, is gained from the remains of the bones of the domesticated sheep discovered from time to time in the ancient caves, and the beds of lakes, where primogenital mankind lived and died, and left the remains

of their work as a study for us to learn the special habits of those aboriginal parents of the human race. The facts we learn in this and other ways all go to prove that the improvement of the sheep dates back to unknown centuries, thousands of years, and since that ancient time we have the best reasons to know that there have been constant and successful attempts to improve the race of domesticated sheep, by selection and breeding the selected animals, so selected for their better form, more valued fleece, and general improved habits and conditions. And thus we have to-day distinct types of sheep varying as to locality, climate, and the kind of people who bred and reared them. And we may be



ROCKY MOUNTAIN SHEEP.

sure that this process of improvement began with the most ancient races of mankind, and that these ancient, even prehistoric shepherds, knew something about the art of breeding, and so necessarily something of the science, as we distinguish it, of breeding sheep. We have an example of this fact in the shrewd conduct of one of the earliest recorded breeders, Jacob, who kept his father-in-law's flocks in that great pastoral region known as Midian, who by devices, doubtless well known to the shepherds of those days, so influenced the nervous functions of the ewes, as to bring lambs marked in a peculiar way by which he secured a questionable advantage over his old father-in-law. We cannot doubt that these old shepherds knew a good deal about

breeding sheep, and their acuteness in this way doubtless advanced the value of the flocks very largely.

Breeding is the art of influencing the character of any animal by changing the conditions of life, and regulating the reproduction by selection of individuals, as well as by intensifying by the best methods of feeding all the natural propensities. Thus there must be an adequate foundation to begin with; a basis to stand upon; and in selecting this starting point the natural or acquired ability of the breeder plays a most important part. Thus we may say that there are three general principles or laws by which the art of breeding is made practical. These are heredity, selection and variability.

Heredity is a special function of all animals, and the common maxim of the breeder, that, "like produces like," is to be taken as the starting point. The reproductive process is largely influenced by what may be said to be a nervous force, so far as regards animals whose functions are all controlled by the nervous system. It is different in the lower forms of life, as in those species which reproduce by a simple process of division, or as it is commonly termed, fission, or separating into two parts, each precisely alike. This is the principle on which all the lower organisms reproduce themselves. A complete organism simply produces a dividing membrane, which when complete forms one of the walls of each of the two parts into which it separates, and the two, then completed forms, again repeat the process, thus prolonging the life of the race indefinitely. In this instance heredity is perfect and paramount, and each new form is precisely like the parent of it. It is the same with those plants that grow from slips or cuttings, or from tubers, which are in fact a part of the plant itself. And yet in these there is frequent variation as in the potato, or the dahlia, which as it is termed, sports and varies from the original. But in animals, while there is a process extremely like the fission or duplication of the lower organisms, yet the action and influences of the nervous forces come in play, and affect the fetus in its interuterine growth, and thus we have variations in animal reproduction which, at the same time, interfere with or aid the efforts of the breeder, giving him in the latter instances a new departure which he is often

able to use as the basis of improvement. The force of inheritance, however, is the main point for the breeder to consider and turn to his advantage, and it is not to be overlooked in the study of this important part of this subject. As has been remarked by Mr. Darwin: "It is hardly possible, within moderate bounds, to impress on those who have not fully studied this subject, the full conviction and impression of the force of inheritance, which is slowly but surely acquired by rearing animals by the study of the various treatises which have been published on the subject of breeding of our domestic animals, or by conversation with experienced breeders."

But in this regard we must give due force to that peculiarity existing in all animals, which is known as atavism, or going back, and by which, after all the work of a breeder, will tend to interfere with his reasonable expectations by the appearance of long back inherited peculiarities by which new difficulties are thrown in the way of expected progress. And not only are forms and dispositions thus inherited from ancestors, long back removed, but the work of the breeder is still further complicated by the reappearance of undesirable points which have been thought to have been bred out. And, again, the strangest irregularities are thus produced not only by inheritance, but by accidental peculiarities which arise through the action of unexpected events on the nervous system of the female animal. For as Jacob produced streaked and spotted progeny from his sheep and goats, by the use of peeled willow branches, and as we read the sheep were streaked and spotted, and had brown faces, in consequence of the effect of these unusual appearances placed before them at the coupling time, so similar effects may be produced by we know not what accidents, to divert the expectations and purposes of the breeder. We know the very great strength of inherited tendency to diseases, and how the produce of unsound animals, even to the distortion of the joints and limbs, is likely to be affected in a similar way. Thus both for good or ill, the breeder must take into account these natural transmissions of defects or inherited peculiarities, and be prepared to meet them, and suffer disappointments and delays, unless by the severest scrutiny he avoids all these risks. Indeed these conditions may be accepted as

an unavoidable part of the practice of breeding, to be guarded against with the utmost care. This necessarily brings us to and leads on to the consideration of the second point under consideration which is that of selection.

If the breeder can always be sure of the full history of the animals he makes use of for the improvement of his flock, there would be a more certain element in his work. This, however, is scarcely possible, unless the standard herd books used for this purpose were an exact record of the whole life history of every animal entered therein. This is not supposable, for as the owner is then to be the historian of his animals he could not be expected to make any such possible fatal record against them. So that after all, the breeder is to fall back on his own judgment, and take the chances of success or defeat, partial or complete. And as he may find the produce of the best selected animals may vary from his desired standard, he must undo the work so far and begin again. This illustrates the necessity of the full acquaintance of the breeder—the special breeder is here referred to—with the history of the flock from which he selects his animals and by the exercise of good judgment, and with a full knowledge of the source of the animals he selects from, take those only which he may be sure will meet the ends he has in view, as far as possible.

This selection, of course, can only be made by one who really knows what he wants; the ends he has in view; the defects of his own stock which he desires to get rid of; and the special points which he wishes to develop in his own flock. In fact, it is as in all other business and professions, one must have a full and accurate knowledge of what is going on in his special line or pursuit. And after all there is something more than mere knowledge involved in this. For we find many of the most successful breeders depend on an intuition—a natural instinct of the fitness of things on a first view—often more than on any method for which they can give a reason. Undoubtedly the breeder has what he needs fixed in his mind, although he cannot express it in words, and when the right animal is seen it appeals to this unspoken and unspeakable sense of fitness; and the selection so made is generally the best for the purpose required.

But this is not the work of a momentary impulse. Time is

to be taken for thought and comparison before a selection is made. It may be, however, that one single point is in view. This simplifies the matter. Mr. Bakewell spent months in selecting a ram with the kind of head he once wanted. And although there were undesirable points in other respects about the ram, yet he got the head, and then went to work to breed out these by other selections. This takes time, but the fixing of a type is a work of time. The history of the breeding of our modern sheep is full of examples of this long life work, and the best of the old breeders were never able to preserve strict uniformity in any breed. Two flocks of the New Leicester were started at the same time by two breeders, and the flocks were kept quite distinct for fifty years. At the end of this period the two flocks were entirely different in type, and each had wholly lost the special characteristics of the original flock. Here is an instance of the effect of personality in the breeding. The type desired—according to the fancy of the breeder—had prevailed in each flock; and each had departed greatly from the type of the original flock from which the two sprang. Variation must have a distinct cause. Such a cause exists in the breeding of small flocks in each of which there has been special methods of selection of rams for breeding. It is impossible to maintain an invariable condition or habit of form, among many flocks, for the personality of the owner must inevitably appear in each one. Thus it is that breeders of any special class of sheep should frequently examine what their competitors are doing, so as to avoid any serious loss of uniformity of type in the breed. In this our herd books, and the annual exhibitions are extremely useful, and it is doubtless by means of these annual opportunities of exhibiting the skilled work of the breeders, all working towards a single standard of excellence, that we shall be freed in a great measure from the risks and failures of the old breeders, who made their work a secret and each one of whom was working in ignorance of what others were doing.

There cannot be a serious divergence of results when every skilled breeder is working with a portrait, as it were, of his desired sheep before his eyes, as is the case with the standard before him and the actual sheep exhibited at the fairs. This modern improvement is the greatest security

for the breeders who have the standard in their mind, and must—for successful competition for the premiums—work in strict conformity with its requirements.

Possibly the Germans have reached the high excellence of their best breeds of sheep by the happy thought of employing experts for the selection of rams used for breeding. These expert judges travel through the country and visit the flocks of the breeders, and especially of the large estates of the wealthy proprietors. They advise the owners of the special points to be bred for in their flocks, and select those rams that are the most desirable to preserve unity of type. The immense advantage of this is apparent at first thought. It gives to many the mind of one, and thus uniformity is gained, and once gained is preserved. This is valuable, to not only the special breeder, but to the mere wool producer whose income depends, not so much on the actual weight of his product, but of any special value it may have for the manufacturer. We may come to this in time ourselves, and doubtless find the advantage of it in the right selection of the rams for the wool grower, as well as the mutton producer. As the great majority of our flocks are low bred, or half bred, or not bred at all, there is unquestionably a vast improvement possible in the increase of the value of them, for all their products, including rams for the use of the ordinary shepherd who is unable to breed his own, an unwise thing to do anyway, as may be exemplified by the example given above of the two flocks of pure Leicesters. As it is, there is too much of the uncertainty, if not ignorance, of the precise needs of the flockmaster; too much of the carelessness, and sometimes too much of the willfulness among shepherds; which may be illustrated by the common adage relating to a person known as Dr. Fry, who was much disliked by some one, who gave his reason in this way:

“I do not like you, Doctor Fry,
I cannot tell the reason why;
But I do not like you, Doctor Fry.”

For and against the sheep in its variations, many a shepherd may say the same of those he does not approve of, and yet for want of the accurate knowledge, which is nothing more or less than the science of his profession, the shep-

herd may lose great opportunities of improving his flock by missing the best medium for so doing.

Among the most effective causes of variations we may mention the influence of climate, soils, and other influences growing out of them. It cannot be doubted that the success of the American Merino has been largely due to the more suitable climate here, and as well to the soil of the localities where they have made the greatest success. It is the same with other localities. For instance, the high-bred horses nowhere do as well as in Kentucky, where the limestone soil, the moderate climate, and the blue grass pastures, all combine to give constitution and stamina, with the endurance owing to these which are secured nowhere else to the same degree in the world. So the Kentucky Shorthorn cattle have excelled in every way their imported parents, and in regard to sheep, it is found everywhere, that the American Merino is the first of its class in the world. With the same care and skill applied to other breeds, we may unfailingly expect to advance these breeds to a like high point, if only the same skill and good judgment are exercised in regard to them.

Climate is one of the most effective influences for good or evil on the sheep. While the sheep is a cosmopolitan, and thrives everywhere to the satisfaction of the shepherd, yet the most favorable influences in any new country must be secured for the immediate success of introduced varieties of sheep. That the American climate (including Canada with the United States in this continental application) possesses a special adaptation to breeding and keeping of sheep with entire and immediate success, is unquestionable. There are ample proofs of this in the history of every kind of sheep that has been imported and bred. The American Merino has found purchasers at the highest prices in competition with the sheep of every other country in which the Merino is bred. The English breeds have prospered equally with our Merino, and there is no reason why every valuable breed of sheep, whether adapted to mountain, or valley; the open range, or cultivated farm; the marshes, even; may not become a means for the profitable investment of capital, and an occupation for the labor of the shepherd, as well as for the manufacturing industry and the employment of labor in disposing of our wool.

The question of acclimatation has been settled, and the favorable influences of it on the various breeds of sheep, existing anywhere, admit of no doubt whatever. It is, however, a matter for the study of the breeder, lest he may make mistakes in trying to adopt the different breeds to circumstances of locality, climate, soil, and variety of culture that may not be the most suitable for some special needs of the shepherd. Every kind of climate is to be found, from the temperate regions to the semi-tropical; and the sheep has proved itself at home from the most northerly part of Canada to the warm Winterless regions of the South, for some special kind which may be best suited for the new home.

But it must be well understood that the fixing of types suitable to varied conditions, is not the work of a year or a few years; but is to be the patient study and experiment of a lifetime. It is not in a haphazard way, either, that we can reach success. The sheep is an impressible animal, but equally apt to lose its temporary individuality. The whole experience of a century of breeding has showed that types are still uncertain. In this regard acclimatation is a slow process, for it is not always that this, and the animal, may match immediately. The process of acclimatation goes by steps; each making a short progress; for the individual life is too short to wholly change, even a sheep, into a wholly new animal. History goes to show that this process is only developed slowly, for the constitution has to be changed to meet the new environments. And it has shown that the majority of animals do not submit easily to changes of climate; some may; those which are readily impressed by their situation will; but at the same time there are effects of climate which are not desirable, and these are to be overcome by the slow process of cultivating the variability of the sheep, by due mixtures of new blood, which may require many years to become fully acclimated.

In the breeding of any of the domesticated animals, as of the domestication of any wild race, climate is to be seriously considered. Indeed, any violent change of condition is to be avoided, unless by a process of crossing the new blood on sheep already habituated to their special environments. Thus it may be wise to cross our native

variety, or even a cross of it by other and improved breeds, with rams selected from quite different localities; that is, for the mountain ranges the Lincoln or the Leicester or the Shropshire rams may be used, but it would not be advisable to introduce these breeds wholly and suddenly into these entirely different conditions; and for lowland flocks it may be safe to cross them with the Romney Marsh rams, or with a sheep, such as the Cheviot, reared in an intermediate locality, neither mountain nor plain. Strong variations are always to be deprecated, but may be made gradually by the use of sheep from an intermediate locality, or which have been acclimatated by one or two years residence. So the Merino, naturalized by centuries of adaptation to warm dry climates, to lowland pastures, to mountain ranging, and which has exhibited wonderful endurance and facility in meeting and successfully surmounting any supposed difficulties in these ways, has proved itself a true cosmopolitan, and meets every expectation of the shepherd in every part of the world. We find it in the cold, snowy northern New England fields; in the dry plains of California; in the hot climate of Central America or Southern Africa, or the rainless ranges of Australia; as well as on our Western prairies, and the vast ranges of our great Northwest. And it should be the business of shepherds to study out the natural history of the sheep and its characteristics, as given in a preceding chapter, and thus make himself acquainted with the special, natural, or acquired disposition of the sheep he fancies, before he commits himself to costly enterprises.

As may be understood, acclimatation is the process of adaptation by which animals brought from different localities are rendered by gradual steps able to withstand the conditions of their new localities, and to not only survive but flourish under these strange circumstances in countries remote from their native habitation and under wholly different climatic effects. Even with the human race, colonization has been attempted disastrously except by slow degrees, and frequently only by the crossing, by intermarriage, of Europeans with the native races. The history of British India affords an example of this difficulty of acclimatating our race, used to sustain all kinds of hardships, and resist the most extreme variations of climate. But the effects of the

Indian climate have been such that after a century of occupation, the British residents in India have been obliged to return to their native country to somewhat lengthen out their shortened lives, due to the baneful effects of an enervating and unwholesome climate. It is the fact that the effects of extreme heat changes the wool of a sheep to hair, after a few generations, and similar effects occur to change the character of the fleeces of the English sheep in the first crosses made under excessive change of climate. Of course, the opposite effects occur when the new conditions are all in favor of the sheep, but this can only be secured by experience; no sufficient certainty can be assured in any other way than this.

But long experience has shown, that, with but little exception, full acclimatation is possible with all kinds of animals except in a few instances, as that, the Newfoundland dog will not live in India; nor do the Spanish breed of fowls thrive in any other country than in their own. This is true with other breeds of fowls, which change their character, sometimes ruinously, when transferred to a different climate. This is most marked in the case of wild animals, which are rarely successfully reared in any other locality than that native to them. Thus the natural adaptation of animals to strange and different climates, directly, has very rarely been successful, and a course of breeding by occasional reversion to the old stock, from its original home, has been found necessary, as well as some considerable time that must elapse before acclimatation can be successfully and permanently assured.

As in all similar changes, acclimatation has been found more easily successful by taking intermediate stages in the process. This fact is of great importance to the American breeders, not only in sheep, but of cattle and horses. Progress by stages has always been found the most sure and effective, and the results gained at each step have been fixed without any apparent reversion or degradation. Thus the Spanish Merino sheep has not been found satisfactory in Argentina, or in Australia, or in South Africa. But the same sheep, after years of training and preparation in the United States, has been most decidedly so. And this is why the shrewd breeders of Australia, made expert by a century

of practice, are fully satisfied to pay the enormous sum of five thousand dollars for an outbred Merino ram. We must not suppose the experienced breeders of that great sheep rearing country are wanting in common sense, or do not know precisely what they want; and when a ram bred in Tasmania sold for this great price the Australian breeder was well aware what he was about. The Tasmanian climate is intermediate with the dry hot plains of Australia, and this



"VICE-PRESIDENT."

Hon. Jas. Gibson's Grand Champion Merino Ram, sold at Melbourne Ram Sales for 1,000 guineas (\$5,000).

gradual change of climate goes a great way to secure the most desirable results through the gradual acclimatation of the sheep. The pictures here given of the rams thus purchased show the fullest good sense and business ability and shrewdness of the buyer. The excess of wrinkles on the sheep is precisely what is wanted in breeding on smooth bodied sheep, and to increase the weight of the fleeces of the progeny of these rams. But the gradual acclimatation is worth still more, for it is an indispensable matter with Australian breeders to preserve the full and hardy constitu-

tion of their flocks by the use of rams chosen for this purpose from an intermediate locality.

It is for this reason that our Merino breeders are able to get the high prices paid for rams in these distant great sheep ranges. Those breeders know just what they want, and find the first step in the necessary preparation of the breed has been made here, and so they come hither to take the best of our rams to complete the process in their own flocks.



"ROYALIST."

W. H. Gibson's Tasmanian Merino Ram, sold for 1,000 guineas (\$5,000) at the Sydney Ram Sale.

It is for this reason too that our breeders may still expect to find a constant demand for our best rams or ewes for nothing more or less than this step in this process of acclimatization, having been made here, it is so much easier to complete the process by the use of these intermediately acclimatized sheep.

But it does not follow that American breeders are not themselves forced to go back to the fountain head as regards some of our breeds not yet as fully acclimatized here. We ourselves need to sustain and improve every breed we have,

except perhaps our fully Americanized Merino. The French or Rambouillet, or delaine variety is, we think, hardly to be included in this full preparation for entering the ram markets of the world. It will doubtless come in time, and all the sooner as our breeders will fix on a settled type for this class of sheep. The nature of the animal, as a scion of the old best Spanish breed, improved by the culture of the French breeders, has been improved by the first step in this process, the second step is being taken here, and it must go without saying—as a distinct scientific certainty—that our breeders will soon have the market of the world for these rams as well as for the true American Merinos, if they will continue to breed for the type of sheep wanted to perfect the flocks of other countries, and to sustain them in this perfection by the addition of blood acclimatized here. It is thus seen that this matter of fixing a type in conformity to the conditions of an intermediate stage of the breeding, is one of the most important to be considered by the American breeder.

The following illustrations of this subject may be offered just here:

The method of acclimatation suggested in the foregoing lines should be regulated by several precautionary considerations:

First: It may have no certain great or definite effect in adapting the constitution of individual animals to a new climate, and the various differences growing out of it; but at times may be wholly destructive to it, and wholly change for the worse all the weakest points of the animal.

Second: It has been shown by sufficient experience that the offspring of animals vary in their constitutional adaptation to the climate, and therefore this influence must be controlled and enforced, and increased and kept up by the effect of inheritance, through a wise course of breeding, and a careful and skillful selection of the most successful instances of this adaptation.

Third: It has been shown that great and sudden changes of climate have resulted in serious degeneration in regard to health, and a considerable check to reproduction. Barrenness has resulted in many conspicuous instances, as a result of wide climatic differences, by which the nervous system

has been so much weakened that the reproductive functions have been rendered wholly inoperative.

In order therefore to succeed in the acclimatation of animals in any strange and dissimilar climate—to that in which it has been reared, and in which it is found that it cannot directly maintain itself or even live—much less increase its kind—certain plans must be adopted.

An intermediate station must be provided, in which the differences of climate and other circumstances growing out of it, may be made available to partly secure the course of improvement, and make this permanent during a course of time, for some years and generations at least. Then when favorable variations have been secured and made permanent, a careful selection of subjects are chosen to breed from to fix this intermediate type, which is then made the basis of another advance. As in fact, an invader making an attack upon a strong and well defended country, first makes a permanent station at the scene of some great victory, and there entrenches himself, fortifying the camp, and in some cases building and populating a strong city, and from this point of vantage making new incursions, and so repeating these advances, until the last stronghold has been captured and occupied, when the whole region then submits to the conqueror. So the breeder makes a step in advance, and there rests until this step is found to be firm and fixed. Then another advance is made by another cross or selection of the fixed type reached, and this when fixed is made the point from which another advance is made. This is the whole history of the art of breeding in this direction, and has been the basis of the work and success of all the eminent breeders of history. It is the way in which our various fixed breeds of sheep have been formed, and the expert of but moderate knowledge and experience knows this to be true, as the result of his own work, if he is inclined to take this as his guide.

Next this intermediate station, or situation, or condition, having been securely reached and held, the most eminent members of the flock are selected for another advance, by whomsoever this advance may be made. The hardiest examples of the breed, so far acclimatated, are selected; and these submitted to the most careful culture until the

type is again fixed securely; and so this process goes on until a satisfactory fixity of type and a general close adherence to it of the individuals, have again been secured. And then it will be yet advisable to go back to the nearest fixed type, for the reinforcement of the stock.

It is seen how much time it must take to transfer any breed with satisfactory success to a wholly different and distant climate. It is this difficulty which leads the breeders of Australia, South Africa, South America, and other distant localities, to continue to reinforce their flocks with new blood from our herds, and to force our own breeders to return to the original flocks from which their herds have sprung, for the reinforcement of their constitution and specially desired excellencies for which at first the flock was chosen.

It will thus be the wise course of breeders seeking the improvement of their flocks to find some intermediate source for the new blood to be infused; and to seek this in some intermediate locality if possible. It will not be wise to go back at any time. This is only starting again from the same beginning point, whereas the gain made should be the new point for a new improvement. Thus the American shepherd, in the reinforcement of his flock, will go to the near-by breeder, who has made a special success of fixing a good type of excellence on his stock, and there procure the new blood for the improvement of his, not yet fully improved and well developed flock. And thus it is that the professional breeder must be the go-between for the shepherd and the original source of the type of sheep kept by the shepherd. It is in vain for the mere shepherd to maintain the excellence of any flock without occasionally and at short intervals going back to the father flock, for the reinforcement and improvement of his sheep, until in full time the process of full acclimatation has been completed and the desired type secured.

Among other conditions by which the reproductive process is effected, for good or ill, are those depending on the feeding of the flock, and the age of the animals. And the sheep being—as has been already said—one of the most easily impressable of our domestic races, it may be readily conceived that these conditions must have a large influence

over the character of the progeny, as well as the sex of it. The sex is an all-important matter to the shepherd whose flocks are, and have always been, valued by the number of them. But there is reason to believe, as the result of experience as well as through special scientific experiments, that the sex of the produce of a flock depends very much on the physical condition of the sheep, both as to age and robustness, which is due not only to the natural vigor and hardiness of a race, but to the means of subsistence. Of course food is the beginning and end of the condition of a flock, and the abundance of it as well as the nutritive value of it—which is naturally synonymous with abundance—must have its effect on the natural vigor of the animals, which too must be the prevailing influence of the feeding.

The natural law, both for wild and domesticated races, is that the fittest must survive. The most robust, the young and ardent, the best conditioned, together with the ample supply of food by which these conditions are secured, then, will be the rule on which is based the ratio of multiplication of a species. The breeder is to take this into account as one of the most important, we may think, of the rules by which he must be guided in the pursuit of profit from the flock.

Naturally in any herd the younger animals will be the most active and eager breeders. In the strife for the possession of the ewes, the hardiest ram will always be the victor. The older ones—as is the case with our native buffalo, elk, deer, and wild horses—are driven from the herds, and roam by themselves in abjective solitude. This is one of the laws of existence among all kinds of animals. Even savage races of mankind follow this rule. The same rule prevails in the human race, by virtue of the selection of the fittest, even in civilized society; for it is the most attractive persons that mate, and the young are chosen in preference to the old. This is one of the reasons for the great increase of population in nations in which the degree of prosperity is the measure of the increase in numbers. It is the reason why the American people are increasing more rapidly than any other in the world, and the same is the reason why the French people is practically stationary as to numbers. There being no other nation in the world than ours, in which the

means of living are so easily obtained, the marriages are early, and the families are large; and in addition to our native population, we have a very large recruiting to it annually by young and vigorous immigrants. Of course any natural law applies to all kinds of animals, and as regards sheep, most easily increased by prosperity as well as by misfortune, the law prevails with them to the fullest extent.

With our domesticated animals it is the number of females, and the vigor of the males, by which the rate of increase is determined and governed; so that the flock which is coupled with young rams has been found to be more prolific of ewe lambs than that served by old rams. This has been made a subject for accurate experiment in France, and the results have been shown directly in the line here pointed out. For instance, a flock of ewes served by rams less than eighteen months old brought 35 male lambs and 76 females. Of the produce, that from four year old ewes amounted to 5 males and 21 females. Of two year old ewes the produce was about two females to one male. On the other hand, ewes served by four year old rams brought 54 males and 31 females; of the three year old ewes the produce was about evenly divided, but of two and four-year-olds the male lambs were more than twice the number of the females.

This result has been noted in ordinary flocks, and it goes to show that if this rule is absolute, which we may readily conclude and admit, as it is based on a well known natural law, which is operative under all circumstances, and founded on all reasonable probability, the breeder may turn it to his own special advantage, as may be so fitted and most applicable to the nature of his pursuit. The breeder of rams may largely increase the value of his produce by the greater number of salable stock, while the shepherd desiring number without regard to anything but permanent increase, may guide himself in conformity to this rule.

CROSS BREEDING.

In cross breeding, the shepherd or special breeder as well, is handling very sharp-edged tools, as the saying goes. He is entering on the most intricate part of the business. But as it is safe to use such tools when they are handled

with skill, so the shepherd desirous of increasing the value of his flock for mutton, or fleece, may do so with success if the crossing is done judiciously. This is, as has been previously stated, a common practice among the German shepherds who employ experts to choose the rams that are best fitted for the special use for which they are desired.

The crossing of sheep is a distinctly temporary purpose. It may be to get early lambs, or black-faced lambs which in most of the lamb markets are most highly valued by the butchers, and justly so on account of their size, solid, compact form, and early maturing. When extra early lambs, known as house lambs are the end in view, the cross breeding is indispensable, and it has long been and still is the prevailing custom in England, from which country the fashion has been introduced here, to keep Dorset ewes for this purpose, crossing a Southdown or Shropshire ram on these ewes, so as to bring the lamb about September; when it is ready for market after having been reared in the house by the Christmas holidays. As the ewes of this breed will take the ram at any time of the year, they are bred to one of their own breed to reinforce the flock. For this use this breed is the most valuable of all kinds of sheep. It should be noted that the Somerset ewes bred in the adjoining county to Dorset, and which has precisely the same mild Winter climate and agricultural character, are practically, and all but nominally, of the same habits and breeding as the Dorsets. The greatest scope, however, for cross breeding is on the native sheep which, although profitable on the rough, sparse pasture fields of the ordinary farms, but especially in the Southern States, do not return sufficient profit for the higher farming elsewhere. Here it is frequently desirable to rear cross bred sheep for both the fleece and for the carcass. Doubtless it is most desirable in such cases to procure good rams, of whatever breeds may be most desired, to cross on the flocks for the purpose of getting lambs which are excellent feeders, and by providing such food crops as rape or turnips, or even sugar beets, or for feeding in the vicinity of some sugar factory, on the waste pulp of the beets, along with the home-grown grain and coarse fodder.

On the extensive ranges of the West, from South to

North, this practice may be made extremely profitable, for the wool so procured; and this is done in localities where it might be inconvenient to keep the higher classes of sheep for the main flocks. In this way, by the use of a Cotswold, Shropshire, Leicester, or Lincoln ram—in fact of any of the special heavy-bodied and fleeced rams—the produce may be doubled with ease, and more profit, than the mere doubling of the fleeces, by the heavier carcass. The first cross so made is rarely disappointing to the flockmaster. It is the basis of the wool product of those vast sheep ranges of Australia, Argentina, New Zealand, and South Africa, from whence a large business in shipping the frozen carcasses in the cold-storage steamers expressly fitted for this extensive and constantly increasing trade, is also thus secured.

The scientific process of cross breeding is based on the well established principle that the first cross is always satisfactory. The natural tendency to go back to the original coarse or inferior race is not shown in the first cross. And by judicious selection of this cross bred progeny it is possible to make in time a settled and acclimated cross breed which may become sufficiently prominent under a wide course of selection and breeding during a few years. But to do this the ram is to be changed yearly, securing one from an unrelated herd with the special needed character for the further improvement of the flock, by the weeding out of inferior ewes, and the retention of those which show the most marked likeness to the parent ram. It is a frequent custom among the Australian flockmasters to change the ram every year with neighbors, or when large flocks are kept to divide them up on the ranges, changing the rams from one to the other. In this way a valuable cross breed is established in time, but it is scarcely ever so firmly established on account of the climatic difficulties in the way, as have been mentioned above in this chapter, as to remove the necessity for the infusion of new blood at such times as the need for the renovation may become apparent.

Only a few men are adapted by natural affinity and shrewdness to succeed as breeders of a mixed flock. Long years and close study, with a natural aptitude to judge of needs, and the means of supplying them, are indispensable

for success in this line. And in such instances as where extensive flocks are owned by one master, and a special flock for breeding rams for home use is kept, it is decidedly desirable to employ, permanently if possible, at least one shepherd who is capable of taking charge of this ram breeding flock, and of choosing out of it the rams best suited for the use of the general flocks, as may need to be selected year by year.

INFLUENCE OF SOILS ON THE HEALTH OF SHEEP.

It goes without saying that only healthy sheep can be profitable to the shepherd. It may not be that the death rate is excessive, the mere weakness of the system, for want of the vigorous action of the vital functions, is sufficient to cause a low state of health, first to be noticed in the failure of the fleece, and the subjection of the flock to frequent attacks of illness. Some diseases, such as myelitis, for instance, which is known by old-fashioned shepherds as rickets (paralysis of the hind parts, and sometimes of the brain) of which the most prominent symptom is that commonly known as staggers, when the sheep run about evidently blind to a varying degree, so that they stumble over every obstacle in their way, or wander aimlessly about, finally dying of simple exhaustion, and others of the same nature due to the disturbance of the functions of the brain, and all due to want of natural vigor, all those are found to be most prevalent on certain kinds of soils, and do not exist on others.

Of course, we understand that the nature of the soil regulates, and very seriously affects, the actual composition of the herbage of cultivated crops grown. Thus we know that clover—for instance—has a largely varying proportion of lime and potash in its composition, in some cases having a largely increased quantity of one of these, and in others a great deficiency. And if so, it must follow that other kinds of herbage must be affected in the same way. Thus we know that on some soils the ash of clover has easy fifteen per cent of potash in it, while on other soils there is fifty per cent; while the lime varies in the inverse proportion of from forty to only twenty-five per cent. And it is

the fact that on such lands as have this excessive quantity of potash, and the least of lime, sheep are subject to these various diseases of the nervous system mentioned above, and that the quality of the fleece will suffer with the health of the animal.

Potash in excess is disastrous to all kinds of domestic animals. It causes a similar disease in pigs to the prevalent one in sheep, the symptoms of which most noticeable are loss of power of the nervous system, with inability to use the hind limbs. And we cannot neglect this fact when considering this great influence of the soil on the character of the growths of it, by which animals feeding on these products of these lands are affected. Wool contains a large quantity of sulphur, and such plants as turnips, rape, clover, tares, cabbage and alfalfa, in all of which there is a large proportion of this indispensable element of the fleece, are well known to be of the greatest value to the shepherd.

It is equally a fact that those localities in which the best sheep are reared, such as Vermont, Western New York, Pennsylvania, Ohio, and generally where limestone prevails, have been the homes of the finest of the flocks. This is especially the fact in England and Scotland; and equally that the old red sandstone, intermingled with a fossiliferous limestone, have been the homes in which the finest flocks of our best sheep have been reared.

The Southdown has its home on the chalk lands of Central England where the downs, lying on this lime formation, produce the sweetest and most healthful pasture grasses, short, but dense, and of the highest nutritive value. The best of the Yorkshire wools, and the best mutton sheep of that county, are grown on a magnesian limestone soil. The Lincoln yields its lustrous fleeces on a similar geological formation, formed by the disintegration of the same kind of rocks, but covered with a fertile soil in which the herbage contains all the necessary elements for the nutriment of this fine breed. The mixed lime and sandstone soils of the adjoining County of Nottingham produce equally good wools; and the Lincolns transferred thither maintain their original excellence. The chalk soil of Kent feeds the Romney Marsh sheep. The Cheviot excels on its same named hills of which the soil is trap and granite with an ample proportion of lime,

and it is a well known fact that the Black-faced Highland sheep is much improved when it is transferred for final feeding to the same kinds of soil, and the rich pastures of Central England. The Cotswold had its home on the limestone hills of which the rich soil furnished the sweetest and most nutritious pastures. And generally, it has been found that the flocks least subject to the many ills of which the sheep is pre-eminently heir to, have been fed and reared where limestone prevails, or where the soil is well drained and yields the most perfect growth of the best herbage. It is also to be remarked that on the light lands of Norfolk, where the turnip and its related fodder crops grow to perfection (as witness the invaluable white Norfolk turnip, there grown for feedings flocks in the fields along with rape and other crops that are rich in sulphur), there the sheep bring the most satisfactory results to the feeders, who go to distant pastures to procure the stock for this feeding by which the farms are enriched. Low lying meadow lands that are made up of the debris of such geological formations, but when thoroughly well drained—for the sheep must have a dry foot—have been found excellently well adapted to the growth of sheep, and it is only on these low lying lands, undrained, that the destructive liver fluke is found injurious.

These suggestions are made to stimulate the study of this most important matter, by American shepherds, so that in selecting farms or range feeding grounds, a proper and sufficient study of the geological conditions of the locality may be made.

CHAPTER IV.

THE SCIENCE AND ART OF FEEDING.

“The feeding of cattle is the most important part of agriculture.” These words appear in a work on agriculture by that renowned writer and excellent farmer, Cicero, who lived two thousand years ago. And we may well believe that he, who was an extensive owner of sheep of the finest quality of the then race of which our invaluable Merino is a direct descendant, gave due credit to the sheep as being the most valuable of all domestic animals in regard to the right and proper feeding of it. It was not only that the food nourished animals reared on the farm, and so made a profit from the flesh and the fleece, but that in the due course of nature the produce of the land being fed to cattle—in which sheep were, and are always, included as one kind of the class of domestic animals—not only nourished the animals fed, but left the greater part of it to return to the land to fertilize it and so cause it to return still more crops for feeding more cattle. And if we study carefully the writings of the many ancient authors, poets and prose writers, which are extant, we shall discover that what they did not know of the art and practice of agriculture is of very little account to-day. What we know, which they did not, is simply the inner causes of things which they were well acquainted with, but not the reasons why they were so, which is really all there is in the science of the art and practice. Thus it is that we may learn much that is valuable from these ancient writers, and get, through the details of their practice, invaluable illustrations in regard to the axioms and rules of modern scientific practice in every department of agriculture.

So important a matter then as the feeding of his flock to the intelligent shepherd, should be studied scientifically, first; and then the rules and suggestions to be derived from

this study, carefully made, will easily form the practice to be followed.

“Out of nothing, nothing comes,” is another ancient piece of wisdom. We can never get anything out of nothing. We must feed a sheep before we can expect it to return to us anything we may expect. The science of this art of feeding, first teaches us of what an animal is composed, by what its life—its very breath—is supported; of what its flesh, bone, wool, and every other part of it, or its products, consists; what is wanted is the natural functions of the animal, and thus precisely what food the animal should receive in any specified time to support it in the manner due to our expectation of profit from it. In short the figures which the scientific expert gives us in these respects are like the book accounts of a business man, in which a person is charged with what he receives, and credited with what he returns. And by a great amount of accurate experiment we have got this matter down to such a fine point, that the shepherd—as any other feeder of animals—may fix on a certain ration for his sheep, and so get every advantage he desires for their welfare and profitable use, at the least possible cost.

To ascertain the character of the food best fitted for sheep we may begin by considering the actual composition of an animal, which weighed 154 lbs., of which the fleece weighed ten pounds.

The body is made up of:

	LBS.	OZ.	GRAINS.
Oxygen.....	111	—	—
Hydrogen.....	14	—	—
Carbon.....	21	—	—
Nitrogen.....	3	10	—
Phosphorus.....	1	2	88
Lime.....	2	—	—
Sulphur.....	—	—	219
Chlorine.....	—	2	47
Sodium.....	—	2	116
Potassium.....	—	—	290
Iron.....	—	—	100
Magnesium.....	—	—	12
Silica.....	—	—	2

The ordinary compound materials of the body of the sheep are given as follows:

	LBS.	OZ.
Water	111	—
Gelatin.....	15	—
Albumen.....	4	3
Fibrin	4	4
Fat.....	12	—
Ashes	7	9

The composition of the fleece, per cent of its pure dry wool, is:

Carbon	49.25
Hydrogen.....	7.57
Nitrogen	15.86
Oxygen.....	23.66
Sulphur	3.66
 Total	 100.00

The yolk, or suint, consists of:

Potash, as carbonate.....	86.78 per cent.
Potash, as chloride.....	6.18 "
Potash, as sulphate.....	2.83 "
Other substances	4.21 "
 Total	 100.00

Besides the yolk, which is soluble in water, there is seven to ten per cent of grease or oil.

It will be evident that as the sheep is kept for its wool as well as for its flesh, the fleece is to be considered as a part of the animal to be provided for in the feeding. But wool is made up of almost precisely the same elements as skin, hair, or horn, showing that all these parts of an animal are really parts of the skin, and a mere change of the form of it. And the only difference between the flesh of an animal and the skin, with its natural covering, and its outgrowths, is the somewhat larger proportion of nitrogen in the latter than in the flesh. This is shown by these figures:

	CARBON.	HYDROGEN.	NITROGEN.	OXYGEN AND SULPHUR.
Flesh.....	51.83	7.57	15.01	25.60
Skin.....	50.99	7.07	18.72	23.22
Wool.....	50.65	7.03	17.71	24.61
Hair.....	51.53	6.69	17.94	23.84
Horn	51.99	6.72	17.28	24.01

A very cursory examination and study of these figures will go to show the almost perfect similarity between all these parts of an animal, and how nature may vary the character of her products in form, but yet preserve the similarity of the materials of which they are made up.

Perceiving of what raw materials a sheep is made up we must think of what materials the food for the production of these parts of the sheep, must consist. But in passing, let us consider for a moment one fact. We see that the horn of a Merino sheep, or a Dorset, has some pounds of precisely the same materials as so much wool contains. Then,

as the horns do not add one cent to the value of an animal, and has really so many pounds of matter in them that might, if turned that way, add so much to the weight of the fleece, it follows that the shepherd may ask himself this pertinent question, Why waste food in the making of a pair of seven or eight pound horns, instead of breeding off these horns and making more wool of the food and nutriment so used to waste?

But this is only one part of the subject of the natural necessities of the animal. Food supports life, as well as growth. Life is the first to be considered. And the support of this calls for a large quantity of nutriment. It may be said that life is supported by heat. The process of breathing, by which the blood is purified by every breath drawn, is a chemical operation which is well worth study. As the blood circulates through the system it takes up a large quantity of waste matter, the product of the muscular movement of the animal, and the action of every vital organ. The bright red, pure blood, which is forced by the muscular action of the heart through the arteries, by which it is carried to the capillaries or minute veins just under, and all through the skin; and these are so exceedingly fine, and are so closely placed in a dense network that the point of the finest needle cannot penetrate the skin, anywhere, without wounding one or more of them and drawing blood; this blood thus passing through these minute veins supply every part of the body with the nutriment that is derived from the food, and at the same time wash, as it were, away all the impurities caused by the constant action of the muscles, and then changing from the bright crimson of the arterial blood, to a dark, almost black, color, returns to the heart, by whose pulsation—like that of a pump—this dark blood is forced into the lungs where it is acted upon by the oxygen of the air breathed. This oxygen consumes these impurities. Some of them are excreted by the skin in the form of perspiration, which is always going on, whether in heat or cold, but mostly under the influence of heat. This consumption of this impure matter by the oxygen of the air breathed into the lungs, is equivalent to a burning up of these impurities mostly consisting of carbonaceous matters, and by this burning, heat

is formed, by which the animal is kept warm, and this heat is known as the vital heat of the body, and it is indispensable to the continuation of the life of the animal.

Now it is well known that when carbon and oxygen unite, heat is formed, and this is the same whether it is produced by the consumption of the carbon in a stove, or in a fire of any kind, or in the lungs of a sheep or other animal. So that it follows that the carbon in the food is actually consumed in the animal and produces heat. This carbon of the food consists of the starch, the sugar—which is produced from the starch—and as well, of any of the other carbonaceous matters of the food that are capable of digestion, and these we call the carbo-hydrates of the food, because they all consist of carbon and water, which is made up of oxygen and hydrogen. These carbonaceous matters of the food we call heat formers, for these reasons set forth. And these make up the larger portion of all food of animals.

Now just here for a simple illustration of—what we are approaching—the composition of a typical ration for any farm animal, as thus:

Standard feeding rations for 100 lbs. live weight—

For each 100 lbs. live weight.....	2½ pounds
Total dry substance.....	2 "

Consisting—

Protein.....	¼	"
Carbo-hydrates.....	1½	"
Fat.....	½	"

This ration may be taken as a standard for a full-fed sheep of one hundred pounds live weight, or for any other farm animal kept for product, as a cow in milk.

There is a waste of other food in the mere living of any animal. If we take notice we may see the act of breathing and of moving causes some exertion of the muscles. This is called work, to the extent that the muscular system is in motion, and every motion of an animal uses up some of the fleshy muscular matter, which is wasted, and carried off from the system by the kidneys, which have a most important function in thus purifying the blood of this waste matter. So that a sufficient supply of this flesh forming matter of the food is to be furnished to make up this waste, as well as to provide for the growth of the animal. This flesh form-

ing matter is called the protein of the food, this word signifying the first necessity of life.

Then we have to supply the fat. This is generally laid up in the manner we all know in the animal, through its flesh, and on the interior of the body; the surplus is deposited on the outer part under the skin.

Thus we have the protein, the carbo-hydrates, and the fat, as the three elements of nutrition of the animal to be supplied by the food.

Foods of course vary in composition. Some consist of the carbo-hydrates mostly, as corn; others are richer in protein, as bran; and some have more fat than others. As a guide in the choice of the various kinds of foods we have some tables of the composition of those in common use, with what is called the nutritive ratio given in a separate column. It is a simple matter to choose the most suitable foods for feeding from the list given, and by noting the nutritive ratio, attached in the column provided for it, it is an easy matter for the careful feeder to make up such a ration as will be at once the best for the feeding effect, and for the value of it in the markets when any purchased foods are needed.

Further on we shall return to this part of the subject, considering at present the matter from its practical point of view.

The feeding of sheep is the most important part of the process of improvement. Looking back over the history of this animal we shall find that the feeding has always been the first part of the process of improvement. This is reasonable as well as indisputable, and we may take it as the first and fundamental part of improvement, and the indispensable preliminary to better breeding. For its characteristics are inherited, as we must believe, then the habit of eating and digesting the largest quantity of the best food, and turning this to growth of carcass or fleece, must be the first means of approach to an improved condition and standard. So that the feeding must come first, and this inheritable aptitude for the making of growth, or of early maturity, be made the basis of the improvement desired. Although this view is stubbornly contested by some of the scientific people, and breeding is placed first in this category of means of im-

proving our domestic animals, it seems that such a view is wholly untenable, and quite opposed by the practice and results of breeding. It is unreasonable as well, for if the breeders' axiom—like produces like—is true and well founded, then we must first make the parent what we wish, as far as we can by stimulating the ability to turn good food into growth, and then by breeding from these improved feeders get a progeny upon which we may be able to improve still further in this direction. Were it otherwise, we should have no starting point to breed from for the improvement of the flocks, and it has been shown in the previous chapter that the art and science of breeding are both founded, as on the most unmistakable and the most solid basis of perpetuating by breeding, those animals together, one of whom at least, but both if possible, have previously undergone a process of improvement by feeding, and the best feeders have been invariably chosen by the most successful masters of the art, as the means of fixing on the progeny their habit and proclivity of turning the most food possible into growth of carcass of the best form, and into a fleece of the most valuable wool. If the art of feeding does not come before, and as a preliminary to that of breeding, all knowledge and experience go for nothing.

Feeding is the main business of the mutton producer. But as has been shown, that the wool is a mere outgrowth of the flesh and skin, partaking as closely as may be of the character and substance of the flesh, we cannot improve the flesh of a sheep without at the same time improving the fleece. These go together. But so far the art of the feeder has been employed in the development of a fine carcass of the best meat, yet at the same time the fleece has been improved in length and quality of staple. Every expert knows, and every shepherd should know, that wool is seriously damaged by poor feeding; every set back of the sheep is marked by a weak spot in the fleece in which the fiber breaks, and the wool is fit only for the cheapest kinds of products. The growth is also arrested, and as an example of the need for good feeding for a good fleece, it may be shown that as soon as the sheep is shorn, and the new growth of the fleece calls for adequate nutriment, the appetite of a sheep is notably increased, and if it is not duly supplied with the

quantity and kind of food needed, the sheep becomes thin, or if the carcass grows the fleece does not.

It has been shown previously in this chapter how the wool of a sheep is made up, of so much nitrogen, especially. This is the chief element, as has been said of the protein of the food. It is the fact, that in the nutrition of an animal, the elements of the food go first to sustain the vital functions, for an animal will live although it loses flesh and becomes thin and poor. Thus the needs for life, the vital life, will be supplied first, and then the secondary product—the flesh—is provided for, and last of all the fleece. Then fat is deposited in the tissues, and on the inside first, and the surplus is laid on the carcass under the skin. Thus it is that the protein of the food is the main element for the full nutrition of the sheep. And in choosing foods those most rich in this element are first called for.

No animal will fatten except on the surplus nutriment supplied to it in the food. Fat is laid up in an animal as a source of subsistence in case of need, to be drawn upon when the food is not in full supply. This is the well known case in the hibernating animals, who hide in burrows underground during the Winter, and live without food, as is the common saying as to bears, who are alleged by some jocular individuals to live through the Winter by sucking their paws. While this is not supposable as a process of nutrition, yet they are well known to feed voraciously on the nuts of the woods, and hide in the warmest covert to be found in the cold weather, coming out in the spring thin and poor in flesh, and devoid of fat. Thus it is that the surplus of the late Summer's food is expended in laying fat, on the inside chiefly, but as well on the outside, for fat is an excellent non-conductor of heat, and thus acts as a most useful blanket around the sleeping animal, which taking no exercise wastes little of its substance, and using up the surplus fat exists comfortably during its several months of hibernation. Thus the fall months are naturally the best for the fattening of sheep, who, laying up fat, will not waste the surplus food in the production of heat, and in so far as they are well sheltered from the cold, and the fleece having made a good growth up to this time, the sheep fatten quickly. But

the best foods for this fattening process are those rich in the protein substances.

An example of this may be given:

A lot of sheep were fed at one of the German experiment stations. They were divided into four groups, and each lot were fed differently as to the proportion of the protein. The first lot were fed a ration made up of 0.220 parts of protein, 1.648 parts of carbo-hydrates, the total food thus being equivalent to 1.868 lbs. daily of food actually digested. The nutritive ratio—that is the proportion of the protein to the carbo-hydrates—was 1 of the former to $7\frac{1}{2}$ of the latter. The actual increase in weight of this lot was a little less than two ounces daily. The dressed weight of the carcass was 48 per cent of the live weight. The last lot of the four were fed a ration of 0.384 of protein, with 1.538 of carbo-hydrates, the total food being equal to 1.922 lbs. daily. The nutritive ratio was 1 of protein to 4 of the carbo-hydrates. The increase in weight of this lot was a little over three ounces a day, and the proportion of dressed weight was 55 per cent of the live weight.

This experiment was fully corroborated by several others having similar results. The Canadian farmers and shepherds use peas extensively in fattening sheep, as well as pigs. Indeed it is the main feed for this use. No other sheep farmers in the world make better results in feeding than these, and the English sheep feeders following this rule, feed largely of beans, equally rich in protein. And no better feeders of mutton or growers of wool exist. Thus science and practice confirm each other, as is always the case when facts are in question.

Every well informed shepherd is fully cognizant of what the French have done in regard to their fine Merinos, whatever sub-name they may go by—Rambouillet, Delaines, or Black-Tops—and how they have more than doubled the carcass weight, and the weight of the fleece at the same time, lessening the waste of yolk and grease in the wool. And we all know what our own breeders have done with the old Spanish Merino. These invaluable results are simply the effects of feeding first and last; of course the breeding has concentrated these results in the best selected sheep, and this has made the improvement permanent by inherited tendency.

These masterpieces of sheep culture, as well as the quite equal work of a full century of the English breeders, has only concentrated the excellent feeding qualities of the best sheep, and fixed the type so that it is inherited with certainty.

We cannot ignore the excellent results of feeding upon the fleece. This, as has been said, is a similar product to the hair of other animals. Every one acquainted with the best breeds of cattle knows how the hair is softened, and increased in thickness upon the skin of those animals having the mellow touch due to the layer of fat immediately under the skin. This is a similar instance, to be well considered, for all animals are made of one blood, and amenable to the same natural laws; and what happens in the feeding of cattle must apply equally to the feeding of sheep.

THE NUTRITIVE RATIO.

We have mentioned the nutritive ratio. This term, however well understood by scientific people, is not so well so by others. We therefore explain the meaning of the term and the method of finding it from the known composition of the various foods as given in the table on a succeeding page.

A great many, thousands in fact, of careful experiments have been made especially by the German chemists at the scientific stations, of the common food substances. These bear a comparative value as the composition of each varies. But as any feeder may desire to select any one or more of the various foods for his use, moved thereto by various good reasons, as the cheapness or dearness, or the supply of different kinds, we have the means of easily determining what quantity of this or that may be equivalent to others. We therefore refer to the table of analyses of composition of the various kinds of foods, and the amount of their digestible nutriments, and by ascertaining the relative character of each, we may easily compound a suitable ration with fixed nutritive value, of any of them.

For example: Let us take good meadow hay, and find its nutritive ratio. Turning to the table of compositions we find that this kind of hay is made up of these nutrients:

	ACTUAL.	DIGESTIBLE.
	— per cent.	— per cent.
Water.....	14.3 per cent.	
Ash.....	6.2 " "	— " "
Protein.....	9.7 " "	56 " "
Fiber.....	26.3 " "	57 " "
Starch, etc.....	41.0 " "	63 " "
Fat.....	2.5 " "	48 " "
	<hr/> 100.0	

The digestible matter of these is stated in the second column. Finding the quantity of digestible matter in each, we find this to be:

Protein.....	5.4 per cent.
Fiber.....	15. " "
Starch, etc.....	25.8 " "
Fat.....	1.2 " "

We then take these digestible equivalents—for it is only the digestible parts of the food that count in the feeding of an animal as will be easily understood—and calculate the quantities of each.

We then make this comparison:

Digestible protein	5.4
Digestible fiber.....	15.
Digestible starch, etc.....	25.8
Digestible fat	3.0
	<hr/> 43.8

The fat is seen to be increased to 3. This is because a pound of fat, being wholly digestible, and having two and a half times as much nutritive effect as starch and other carbo-hydrates, it is worth so much more, as food, as starch is. Then we find that we have 5.4 parts of protein to 43.8 of the whole of the carbo-hydrates (the fiber and starch), and the increased fat. All these are made up of carbon and water, hence we call them all carbo-hydrates, but keep the fats distinct. We then find the proportions between these as 5.4 is to 43.8—so is 1 to 8.1.

Then 8.4 is the nutritive ratio between the carbo-hydrates and the protein, or one pound of the former exists in the hay to 8.4 pounds of the others.

This is the best natural nutritive ratio, or proportion, for the support of any animal for ordinary growth. For fattening we increase or widen the ratio by adding to the carbo-hydrates or the fats.

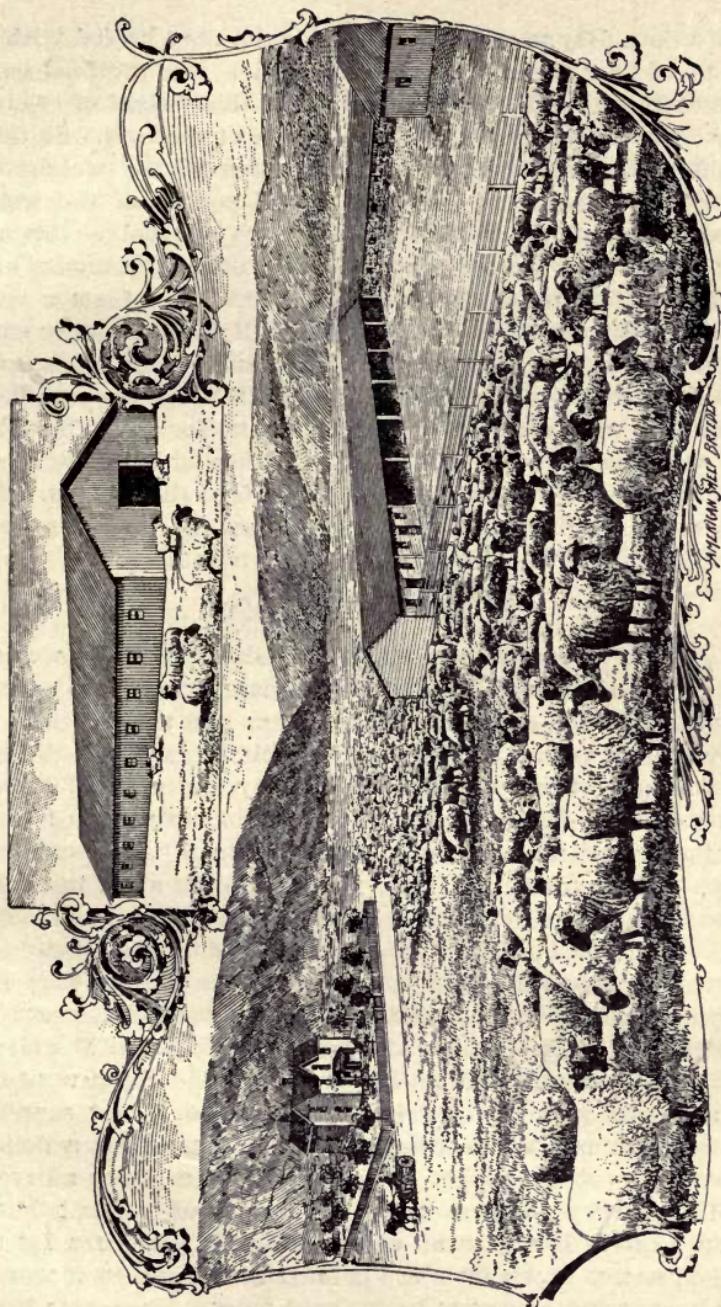
Profit in sheep farming calls for the most generous feeding, carefully carried through with the utmost regularity as

to the quantity of food and the time of feeding. A sheep is a restless animal, and it worries if the time of feeding is delayed only a short time. Then the shepherd, thoughtless of this habit of his flock, hears the impatient bleating, all of which means to him the loss of so much food on account of the loss by nervous excitement and worry of the flock. As a rule we are not sufficiently careful in this regard, and thus we do not meet with so much success in this part of our farming or herding as the English shepherds do. There the sheep is considered the "rent-payer," that is, it pays the whole cost of the use or interest on the value of the land. Here it rarely amounts to half as much as this, for our lands are much cheaper than those of England.

As has been said, the sheep—under the best methods of management—pays three profits: the fleece, the lamb and the carcass. But on farms there is another source of income. This we may find in returning to the figures given above, where we find a large part of food not accounted for as digestible nutrient. What becomes of this? It goes to make manure which fertilizes the land, increasing the crops, thus enabling the farmer to keep more sheep, and thus this goes on increasing constantly. As more manure more crops, more crops more sheep, and still more manure more crops, more sheep, and constantly more profit, through the enrichment of the land.

A well fed flock is the most profitable property a farmer can own. It is said the dairy is this. But the sheep take the palm from the cows every time. A cow, if only fed for milk, takes more fertility from the land in a year than ten sheep, yet it is figured that seven sheep may be kept on one acre in the best manner. Sheep are fed with profit in England, the whole of Great Britain and Ireland may be included in this name, and equally in France and Germany, on land worth, and paying interest or rent on, a value of five hundred dollars an acre; and the reason for it is the skillful methods of feeding, of which the growth of root crops is the chief staple element. This we will say, with the strongest emphasis, is the key to complete successful keeping of sheep on farms.

Sir J. B. Lawes—the first agricultural experimenter in the world—in his most complete reports of his work during



A MODEL MONTANA RANCH. — [Drawn from a photograph.]

more than fifty years, proved that sheep may be fed with a profit of fifty per cent more than cattle. For the food consumed the sheep laid up an increase of live weight of twelve per cent, while cattle increased only eight per cent. So that eight and a half pounds of food increased the weight of sheep as much as twelve and a half pounds of the same food increased the weight of cattle. The wool is thrown in as a bonus to the feeder of sheep, and this we may believe will pay the cost of the feeding. So that the farmer who feeds a flock of sheep over a Winter will make fifty per cent more weight of the same food as compared with cattle, and have the fleece besides. The lamb will offset the calf if it does not largely exceed the profit in it, for there may be seven lambs reared for one calf, and this without the labor of attending to the calves. The lambs feed themselves. Besides the profit from the lambs comes in within a few months, while the calf takes more time to mature.

FEEDING FOR LAMBS.

One of the most profitable methods of feeding a flock is to purchase a bunch of ewes in the late Summer, or earlier if possible. By good feeding, while on the aftermath of a clover field, with a run on a grain stubble, until the Winter sets in, and then feeding on clover hay and a small allowance of oats, and a still smaller feed of corn, with a few chopped roots, and a change of the grain to bran occasionally, making use of a cheap, simple feeding shed, in a dry yard, a flock of sheep bred to a pure Cotswold ram has made a profit of one hundred and fifty per cent on the money invested for something less than a year. It was a small experiment made by the author to test this matter of profit to the farmer made in this easy way. The value of the large quantity of manure left in the shed when the sheep went on to a second year clover field, in the Spring, is not counted in these figures, but it was well worth more than a dollar a head for the ewes kept. The sheep were common natives, and had they been a better lot the profit might have been larger. But it is an easy matter to procure a lot of picked native sheep from the passing droves, when it would not be so easy to procure better bred ewes. The better bred lambs, however, made the most of the profit, and proved the

great advantage of crossing such a ram on a flock of the common natives.

The Winter feeding of a small flock may thus be made the most profitable part of the farmer's work. There is a wide scope for it anywhere, and if the lambs thus reared are kept for a permanent flock, an equal profit might be made every year. Some of the most successful farmers make a practice of feeding sheep in this way to consume the roughness of their crops, the straw, the corn fodder, or these made into ensilage, with a moderate allowance of grain. It has been found a good practice to cut the green corn stalks taken from the usual husking and mixing them in a silo with the straw. The fermentation the mass undergoes makes a large quantity of the otherwise indigestible food available, and experience has shown that in this way the cost of the mixed feed need not be over one dollar a ton, while it is worth for feeding at least ten dollars. Indeed the silo has solved for the farmer the question of profitable feeding of sheep; for if one acre of silage will feed one cow one Winter, it will feed seven sheep, and this is but one half as much as has been shown to be easily possible for a dairyman to do with his cows. This fact may interest thousands of farmers who are asking if the feeding of sheep on a farm can be made profitable. There is not a locality in the whole Union, including our neighboring enterprising Canadians, in which this exceedingly profitable business may not be carried on with entire success. It need only be done with caution, with those inexperienced, to begin with a small flock and feel their way to larger enterprise in good time.

This enterprise is well adapted to the restoration of worn down lands, on the thousands of farms in the Eastern part of the Union. Any of these farms may be made by moderate fertilizing, to produce fodder corn, oats, rye, and turnips, with many of several easily grown green feeding crops, such as oats and peas, rape or millet. The feeding of those of these crops best adapted to it by the sheep on the ground will afford an adequate manuring to yield a good crop of corn, and double the yield of the first crops grown the first year. This is a far easier enterprise, and less laborious and freer from risks than the dairy. It costs less money to start, and brings its rewards in less time.

TABLE OF NUTRITIVE VALUE OF FOODS.

100TH AIR DRY MATTER.—GRASSES GREEN.

Kinds of Fodder.	Fats.	Protein.	Carbo-Hydrates, Starch, Sugar, etc.	Fiber.	Nutritive Ratio.
Common Vetch	4.53	25.14	35.26	13.06	1—1.24
Young red clover.....	7.03	24-50	46.06	11.15	1— 20
Clover, full bloom.....	4.38	17.50	47.42	14.55	1— 30
Alfalfa, young.....	3.88	27.30	38.80	12.00	1— 1.6
Alfalfa in bloom.....	2.63	15.75	47.94	20.78	1— 3.2
Beans, ripe.....	1.93	25.09	59.15	3.43	.....
Bean pods and stalks dry.....	1.36	3.50	58.74	21.60	.....
Peas, early, green.....	.55	4.37	14.48	1.66	.....
Peas, dry.....	2.52	19.91	65.98	7.98	.....
Cow peas.....	4.63	17.19	49.11	.....	.....
California broom grass.....	2.30	8.50	42.67	22.91	1— 5.3
Bermuda grass.....	1.83	9.16	46.06	20.16	1— 5.2
Southern crab grass.....	2.42	8.38	36.59	27.50	1— 4.7
Texan Millet.....	2.12	4.70	47.07	23.16	1—10.5
Blue grass.....	2.43	5.37	56.50	17.87	1—11.0
Red top	1.97	9.09	48.53	21.01	1— 5.6
Mountain oat grass.....	3.43	7.50	48.10	22.42	1— 6.9
Buffalo grass.....	2.67	7.35	49.58	19.41	1— 7.1
Blue joint.....	2.59	6.90	49.87	21.98	1— 7.6
Wild oat grass	3.02	6.84	46.80	25.98	1— 7.3
Kentucky blue grass.....	2.45	9.89	44.96	23.94	1— 4.8
Orchard grass, ripe.....	2.99	7.21	46.92	21.35	1— 7.0
Red top, young.....	3.50	12.25	50.03	19.47	1— 4.4
Red top, early bloom.....	3.38	11.88	50.84	20.20	1— 4.6
Timothy, young.....	4.20	11.55	50.05	18.35	1— 4.7
Timothy, full bloom.....	3.35	9.28	55.22	20.55	1— 6.3
Orchard grass, young.....	3.88	15.05	47.94	17.68	1— 3.4
Orchard grass, full bloom.....	3.03	8.92	50.32	23.78	1— 6.0
Green leaves of trees in woods.....	4.50	15.60	45.61	39.00	.....
Dwarf Essex Rape.....	3.80	12.86	42.47	18.96	.....

HAY.

Mixed meadow hay.....	2.50	9.4	41.00	26.00	1— 8.0
Red Clover.....	2.20	12.3	38.20	26.00	1— 5.9
Alfalfa.....	2.56	16.00	31.6	26.00	1— 2.8
Vetch.....	2.35	19.80	28.5	23.40	1— 2.3
Peas and oats in bloom.....	3.6	14.3	34.2	25.2	1— 4.0
Timothy	3.0	9.7	45.8	22.7	1— 8.1
Wheat straw.....	1.20	4.6	36.9	40.0	1—45.8
Barley straw.....	1.40	3.3	32.5	43.0	1—40.0
Oat straw	2.00	4.0	36.2	39.5	1—29.9
Corn stalks.....	1.00	3.0	36.7	40.0	1—34.4

CHAFF.

Wheat	1.4	4.3	34.6	36.0	1—24.0
Oats.....	1.5	4.0	36.2	34.0	1—23.0
Vetch Hulls.....	2.0	8.5	33.5	33.0	1— 8.9
Bean Hulls.....	2.0	10.5	34.0	33.0	1— 7.4

TABLE OF NUTRITIVE VALUE OF FOODS.—(Continued.)

Roots.	Water.	Fats.	Protein.	Carbo-Hydrates.	Fiber.	Nutritive Ratio.
Mangels.....	88.0	0.1	1.1	9.1	0.9	1— 9.3
Sugar beets.....	81.5	0.1	1.0	15.4	1.3	1—17.0
Ruta-bagas.....	87.0	0.1	1.3	9.5	1.0	1— 8.3
Turnips.....	92.0	0.1	1.1	5.3	0.8	1— 5.8
Potatoes.....	75.0	0.2	2.1	20.7	1.1	1—10.6
Sweet potatoes.....	69.7	0.3	1.9	26.3	1.7	1—31.9

Grains, Dry Matter.

	Fats.	Protein.	Carbo-Hydrates.	Fiber.	Nutritive Ratio.
Wheat.....	1.5	13.0	66.4	3.0	1— 5.8
Rye.....	2.0	11.0	67.4	3.5	1— 7.0
Barley.....	2.5	10.0	63.9	7.1	1— 7.9
Oats.....	6.0	12.0	55.7	9.3	1— 6.1
Corn.....	5.5	10.5	62.1	5.5	1— 8.6
Buckwheat.....	1.5	9.0	58.7	15.0	1— 7.4
Peas.....	2.0	22.4	52.5	6.4	1— 2.9
Beans.....	1.6	25.5	45.9	9.4	1— 2.3
Cow peas.....	1.3	21.6	49.3	4.7	1—27.
Linseed.....	37.0	20.5	19.6	7.2	.....
Acorns, ripe.....	2.8	3.5	46.6	7.8	1—17
Sunflower seeds.....	23.6	13.0	23.9	28.5	1— 7.2
Chestnuts, fresh.....	1.6	4.3	41.3	2.0	1—11.50
Apples and pears.....	....	0.4	11.8	4.3	1—43.0
Pumpkins.....	0.6	0.6	6.5	2.7	1—18.4
Squashes.....	0.2	0.9	9.1	1.0	1—15.8

PRODUCTS PURCHASABLE.

Bran.....	3.5	12.9	59.1	8.1	1— 5.6
Pea bran.....	1.5	13.1	37.8	31.1	1— 5.3
Pea hulls.....	2.5	8.0	43.7	30.5	1— 9.2
Sugar beet pulp.....	0.2	1.8	18.3	6.3	1—13.9
Potato starch pulp.....	0.1	0.8	11.7	2.0	1—17.4
Corn starch meal.....	2.0	3.6	18.8	3.4	1— 7.4
Palm nut cake.....	14.8	13.5	41.0	18.8	1— 7.0
Oatmeal refuse.....	2.3	7.1	57.9	19.3	1— 9.7
Linseed oil meal.....	2.3	33.2	38.7	8.8	1— 1.4

The preceding table is worthy of special notice and study. A large number of these substances may often be purchased very cheaply, and some are especially valuable for fattening sheep or lambs. Such are, of the grains, oats, in the first place, which it will be seen is worth more than corn, while this grain is worth more for the flesh making elements, the protein than the corn. The various kinds of pulse, peas, etc., are seen to be especially rich in flesh-making elements, and thus are valuable for feeding to lambs when growing

fast, and as well for fattening sheep, as the protein tends to make a more useful meat than fat, and the tendency now is to favor meat rather than a load of fat on the carcass. Turnips and ruta-bagas, among the roots, are seen to be well balanced food, and being completely digestible without waste, are not only of superior value for this in itself, but as well to aid in the digestion of other and less digestible food, of which it has been already mentioned that less than half is digestible, in some of them.

It is also worthy of notice that the products of forest land are especially valuable for the leaves, as well as for the young twigs, which are greedily eaten by sheep and form naturally the bulk of the food in wooded localities. The author's experience goes to show that the fine brush of trees, especially of the small growth, may be cut and stacked with great advantage for the Winter browsing of a flock, which will feed at a stack of this stuff in preference to the hay, or even sheaf oats. This fact is of value to Southern shepherds where so much land is left to grow up with brush, when thrown out as old fields for a resting spell, to slowly recover its lost fertility. The very common sassafras is especially palatable to sheep, which will browse down quite large shrubs of it to the roots. The tonic, as well as nutritive character of the sassafras, is excellent, and tends to keep the sheep in the best of health. Sheep have been kept the whole Winter in the South on this kind of feeding, leaving hay for the small growth of the old fields and spending the most of the time in the thicker woods rather than pasture on the open ground, although the grass may be quite abundant. The sweet potato, too, is eagerly eaten by sheep, who will eat off the vines when they are fully grown, thus saving a large quantity of excellent pasture in a season when it comes in very acceptably. Southern shepherds, too, may follow the common method in England, and the European countries, where root crops, cabbages, rape and the so-called collards—a kind of cabbage which grows up to a tall plant—are grown as the usual Winter feeding in the open fields. The really drier climate of the Southern Winter, as compared with that of Europe, too, adds greatly to the advantage of Southern shepherds who by growing these crops will be able to furnish their flocks

with the cheapest and most healthful out-door feeding, and at the same time improve their lambs without cost and even at a profit.

The cow-pea is one of the best of these green pasture plants for the South and middle States, and if gathered the vines make excellent hay. It may be sown in the corn or cotton, and pastured as long as it remains green. The dry grain of it is seen to be equally valuable as the pea or the bean. The common white bean is another neglected crop, for a farm flock, as may be suggested by a reference to the nutritive value of the pulse, as well as all its products. When made into hay with the grain in it, all the pulse tribe furnish the richest kind of feed for Winter use, both for a store flock, as well as for fattening.

Pumpkins and squashes are also not only nutritious food, but healthful, and if chopped may be fed with much advantage. The common impression to the effect that these gourds are undesirable on account of their undue action on the kidneys, has no foundation in fact, and the seeds are especially useful as a vermifuge.

RULES FOR WINTER FEEDING.

It is not altogether the kind of food given to a flock but quite as much how it is given, that counts to the full benefit of the shepherd. The sheep is a peculiar animal, not naturally of a tender character, but one of the hardiest races. Under domestication there is no other animal that calls for the most careful management of the owner than this. It is apt to fret, and soon fall into a poor condition, unless fed at regular intervals, and these so distributed as to secure the full digestion of the food. Once the sheep are left unattended to, they become dissatisfied, and food is wanted to make up for the loss occasioned by the nervous excitement thus produced. The experiment has been tried with two flocks, one fed at six in the morning with strict regularity, every day, at intervals of four hours, making the last feed at six in the evening, when the racks are filled for the night. At the third feeding the grain food is given, the other three feeds being of coarse fodder, for the first, and fourth, and hay for the second. This flock made on the whole fourteen pounds of live weight for the average all

through, over a flock fed three feeds without any attention to regularity.

At the first feeding the racks are cleaned out, and the waste scattered over the floor. The fodder given may be, as in the case under notice, of fodder corn, sown in drills three feet apart and the seed six inches apart in the drill, the variety sown being the Narragansett sweet corn. A large majority of the stalks had ears on them, and the fodder cured in small stacks or shocks was bright and green. There was no waste in the feeding of this, and the sheep required no grain during the feeding of this fodder.

At the second feeding, bright oat straw, at times sheaf oats, was given in the racks, which were well cleaned up by the sheep. The third feeding as long as the corn fodder lasted, was given of this, and the racks were filled up with clover hay for the night. After the appetite of the sheep had become well measured by experience, there was practically no waste, and this should be made an important part of the management, there being much cheaper litter than good clover hay.

But since the silo has been in use, the feeding of silage has been found quite as safe and profitable for sheep as for cows. Indeed its use has been so remarkably successful that doubtless for the farm sheep, as well as for the flocks on the ranges, this provision will be the common practice. The old, but wofully mistaken impression of the tenderfoot shepherd, that sheep would feed themselves on the open range, during the Winters, has brought many a flock and its owners to sudden grief, and this has become so generally known that this sometime practice, not of supporting, but really of destroying a flock, is now a thing of the past, no more to be thought of. The ranch sheep must be fed as the farm flock is, for there is no profit in stopping the growth of a sheep as well as its fleece, for some months, and it must be the custom to provide the Winter feeding precisely the same as for the farm flock. The rustler among sheep is not a profitable animal, and only the well kept flock will pay a profit to its master. Consequently there will be fenced fields, on which such crops as will suit each location and the climate of it, must be grown for the Winter feeding, and the silo must be an adjunct to this system.

FEEDING CROPS FOR SHEEP.

Necessarily the crops grown by the shepherd must be suited to the special climate of each locality. There are locations in the South and Southwest, in which it may be possible for the flocks to subsist on the natural growth, but the prediction may be easily hazarded that the culture of feeding crops will be the rule in spite of the existence of natural herbage, for the Winter feed of the flocks, not only on the



ALFALFA SEEDLING.

farms but on the ranges. Indeed, where land is cheap or costs nothing, being yet public property, it will still be the most profitable method to feed flocks, quite half the year, on grown crops. Fortunately there is so extensive a list of crops that will succeed well, some in one locality and some in others, that there will be no difficulty, and very little cost, in providing the required feed. For one of the most

valuable fodder crops for sheep, the well known alfalfa may be grown in a dry climate, where clover—its near relative—does not succeed. Under good culture alfalfa will yield several cuttings in the season. In Italy, where it is known as lucern, it is extensively grown for feeding, and is cut several times in the Summer, making a growth of eighteen inches between the cuttings. This great growth is procured by irrigation, and the same practice prevails in Chili, in South America, where it is called alfalfa, the Spanish name of it. The plant has been introduced into California, where it thrives exceedingly on the tule lands, or the flat river bottoms, without actual irrigation, and as it is naturally used to dry, warm climate, it is one of the best feeding crops for sheep, either for ordinary pasture or for feeding in racks or in plots, separated by hurdles. This plant will grow where clover will not, and is one of the most valuable for the shepherd. The seed is sown on well plowed land at the rate of fifteen pounds to the acre, preferably in drills, so that the land may be cultivated in the early growth of the crop. Once established it lasts twelve or more years in the ground.

Winter rye is a useful plant for feeding sheep. On good land it may be made to furnish pasture all the Winter, except of course when it is covered by snow, and even then the sheep will reach it if the snow is not too deep, by pawing off the snow. For this purpose the seed should be sown thickly, at least three or four bushels to the acre, and as early as possible to get a good seeding. It will afford pasture if desired only for this purpose, until the corn is planted, when the refuse turned under makes an excellent fertilizer. Where the snow falls lightly, and stays but a short time, this crop will be found one of the best for this use, and cheaply grown. It is said that this crop will continue to grow and make good pasture for two or three years, as it will not mature unless it forms seed heads. But this is stated, not on personal information, but on current report. It is a common practice on farms to pasture this and some other crops by penning the sheep in hurdles, or any kind of light portable fences. Hurdles are made in a simple manner in the way shown further on, of split saplings of chestnut or other woods, and the pointed

ends of the stakes are driven into the ground by a mallet, the ends of the hurdles being tied together by wires twisted around the stakes. It is a small work to move a lot of these hurdles, as the ground is eaten off, by a wagon, and setting them up the desired space ahead. Such a crop as rye, for instance, is doubled in useful value by the use of this kind of fence. It has been stated by that renowned scientist, Liebig, that rye so fed one year will become a biennial as mentioned above and produce a crop of grain the next season, all the more productive by the well known manurial and fertilizing effects of pasturing land by sheep. Indeed, the use of a flock for the improvement of land by this pasturing is one of the most effective methods of scientific culture.

The vetch or tares is a valuable pasturing crop. It is a hardy plant, thriving as far North as Eastern Canada, and having as wide a range as clover.

There are two varieties of this plant, one is the Winter vetch, the other the Spring vetch. This is a plant of the pea family, and is quite as hardy as the pea. We have a large variety of this plant growing wild and in the Southern mountain regions, where it is frequently found in the open woods growing three feet high, and completely covering the ground. It has been grown as far North as the neighborhood of Montreal, and as far West as that fertile tract of territory between Lake Erie and Huron. It ranks as a fodder plant equally with red clover, but yields quite twice as much feeding as this plant. It thrives best on a clay soil, and the soil needs to be thoroughly well worked, the surface for four or five inches deep being made as fine as possible to ensure the best growth. Doubtless the Spring variety will be the better kind for the Northern part of this continent, but it may be sown with safety South of Virginia. It may be sown with Winter or Spring rye by which the vines are upheld, and thus make a more economical feeding crop than when sown alone, with less waste by trampling of it by the sheep. But where the lambs are folded on it within hurdles, there is little waste in this way. This crop is exceedingly valuable on farms having a somewhat worn soil, the nitrogenous character of the plant tending to enrich it as much as a large quantity of manure would

do, the droppings of the sheep adding considerably to this enrichment of the soil. When this crop is fed to lambs, fattening for sale, it is desirable to feed a small ration of corn to balance the nutritive elements of it, on account of the large amount of protein in it. The amount of seed is two bushels per acre, and the best method of sowing is by drills twelve inches apart.

Peas and oats sown together, is another excellent forage crop for feeding on the land, within hurdles, and it has also an excellent result in the soil, improving it greatly, and putting it in fine condition for wheat following it in the Fall. The quantity of seed to be sown is two bushels of oats and one and a half of peas. Seeding by the drill is the best method, but if sown broadcast, which may be done, the peas should be sown first, and covered by the plow four inches deep, and the oats then sown and lightly harrowed in. This crop is one of the best for all purposes, for green fodder, as well as for ripening, when it is cut and fed with the grain, or may be thrashed and the straw fed, while the grain is fed separately. This feeding is precisely what is needed for the full feeding of store ewes in lamb, as well as for fattening with the addition of four ounces of linseed-oil meal per day to each sheep.

Rape has become exceedingly popular with the most advanced sheep farmers of late. During the past three or four years it has been made the subject of many experiments at the various stations where it has been mostly fed to feeding lambs in preparation for the market. The Minnesota Station has given the most thorough attention to this subject, having fed a large number of lambs for market on this crop. The Spring variety has been used, the Winter kind being better adapted to a less rigorous Winter climate. This variety may be made especially useful in the South, where it will withstand the Winter and furnish early feeding, so that the land may be plowed for cotton or corn, as a following crop. Like all this class of plants, it needs a fertile soil, and the best kind of culture. Three to five pounds of seed to the acre is used, being preferably drilled in rows fifteen to eighteen inches apart as the land may be less or more fertile, the wider space being the best for the richer soil on account of the heavier growth. Being a deep-

rooted plant it easily recovers after having been fed down, and the improvement of the land for a succeeding crop is well worth all the cost of it.

On the most fertile soils thirty inches between the rows has been found the most desirable, the plants meeting in the rows and completely covering the ground. It requires the whole ground to itself, the dense growth quite preventing grass seed from growing. Indeed, on the farm where sheep are kept for the improvement of the land it is grown with this second purpose, as well as for the feeding of the stock. There is no other crop which goes so far in this way to verify the common adage about the golden foot of the sheep, for it is most profitable in both ways. It shapes the land so densely by its thick and rapid growth that weeds have no chance to survive, and making a weak growth are smothered in their infancy, as it were, and are completely exterminated. The culture of the land as well, is an excellent preparation for the succeeding crop, and thus the keeper of sheep, if he will, as the saying goes, kill two birds with one stone.

It is rapid in its growth. At two months after sowing it is ready for feeding down or for cutting. The illustration here given shows a two months old plant, taken from nature by the truthful camera. Of course cutting and feeding in racks is the most economical method of feeding, although somewhat more laborious than to have the lambs or sheep gather it for themselves, and while the waste of the crop left after the folding on the land goes to add a valuable manure to the soil, yet by feeding it off the ground we get all the waste left by the flock in doubtless a better and more easily available form, and the return from the feeding in addition.

The illustration is taken from a bulletin of the Wisconsin Station, where an experimental crop was grown for feeding lambs for market. The crop was grown on land in ordinarily good condition, but the yield made goes to show the importance and value of this crop to the shepherd of all branches of his pursuit. A third cutting was made, which yielded on October 22nd, 2,218 lbs., the total yield from this plot amounting to 7,669½ lbs., on one-tenth of an acre, thus making over thirty tons to the acre.

An easy way to make this crop most useful is to grow it adjoining a grass pasture so that the green stuff may be fed in racks on the grass, and by moving the racks a little every day get the whole of the pasture evenly manured by the droppings. This is far more economical than folding the



TWO MONTHS' OLD RAPE PLANT.

sheep on the rape, by which a good part of it is trampled down, and goes to waste as feed.

In this experiment the rape was fed to hogs, and steers, as well as to the lambs, proving it to be equally valuable for this use as well. Unfortunately it is not adapted for the silo, at least it has not been thought to be, but as the German and French beet growers, for making sugar, ensilo the

leaves of the crop, it is scarcely to be doubted that this might as easily be subjected to this process as well. As rape is a close relative to the cabbage, which is kept in good condition through the Winter in pits, as will be described in a succeeding page, the experiment might reasonably turn out to be successful and this crop saved for Winter feeding. As rape contains nearly one pound of sulphur in a ton of it, and this is an indispensable ingredient in wool, in which there is more than three and a half pounds of it in a hundred pounds of the wool, this is a matter of great importance in regard to the feeding of sheep for the fleece, for it is a rule, in both plant and animal growth, that every element in the composition of any product must be fully supplied as regards all of them, or the product will be deficient in quantity or in quality in proportion. The wool grower thus must see that every element of the fleece must be supplied or the weight or quality must be reduced.

This plant has been extensively tried and has been found valuable and successful everywhere from Minnesota and Wisconsin, to Missouri, Kansas, Arizona, in the Southern States (where the Winter variety may be grown) and all through the middle States and Canada. Several communications to The American Sheep Breeder, from correspondents have been published in that Journal, testifying to the value of this crop. From these, two are selected as showing the value of this crop. One from Kansas, says:

"I live 80 south and 60 miles east of Kansas City. On April 6 I sowed broadcast 10 pounds of Dwarf Essex rape seed on a little less than two acres of ground. Notwithstanding we had a very cold, backward Spring, it came up and grew rapidly. On May 20, at which time it was fully knee high, I turned 96 head of ewes and lambs on it, only for a short time at first, but afterwards allowing them to eat their fill of it twice a day, when they would be turned back on grass pasture. At the time I turned the sheep on it it was very dry, and continued so for two weeks, yet it has furnished feed for the 96 head for three weeks, and it is not all eaten up yet. I find that it should be sown on rich soil, where the surface is free from clay, for good results. One corner of my patch was a clay soil, and in that corner

the rape did practically no good, but where the soil was rich I never saw anything grow faster or more luxuriant. It was an experiment with me, as I had never seen any of it before, but I am satisfied that rape is a success in Southwest Missouri. Shall sow a twelve-acre cornfield with it next month for fall pasture."

The other is from Ohio, and runs as follows:

"I sowed 22 acres of corn with rape sown ahead of the cultivators at last cultivating, July 15th, and made an immense lot of feed. Turned the lambs in the cornfield the latter part of August, and kept them there most of the time until after the corn was husked. I next turned in 52 ewes and 12 head of cattle until January 10th. Fed little else excepting a light hay feed occasionally when the weather was too rough to turn stock in the field. A year ago I advocated, in the Sheep Breeder, one pound of seed to the acre for the corn field. My second year's experience justifies my early judgment. The thorough cultivation of the corn kills the weeds and leaves the rape an uninterrupted growth in the protecting shade of the corn where it makes a luxuriant and bushy growth, much better indeed than when sown alone in the open field. I think this the cheapest way to secure a great lot of very valuable feed in the corn belt states. The 22 acres gave me 2,116 bushels of corn in the ear and from 150 to 200 tons of rape, the corn not in the least affected by its companion crop of rape."

The latter is interesting as showing the value of this crop grown in the way described, as a catch crop, as it is termed, that is, one pushed in, as it were, between two other crops, thus filling a space that would otherwise be unoccupied, and not only providing, as is told in this plain story, a valuable lot of feed, but of occupying land that would otherwise have been idle and growing useless weeds. One of the most important lessons a farmer can learn and apply to his practice, is, that land should never be idle, but always growing something of value for feeding to some kind of stock, to make profit; and thus exemplifying the adage taken for the motto of this work; and as well to show how easily this double profit may be made, and to prove another old saying (of Cicero), to the effect that "feeding animals is the most important part of agriculture," and we

may add that the sheep meets this sentiment more closely than any other domestic animal.

ROOTS.

Roots of various kinds are one of the most valuable of the succulent feeding crops for the flock. They are easily grown, are exceedingly productive, yielding under good culture from twelve to thirty tons to the acre, and may be kept when properly stored all the Winter; and some of them as late the next year as July. They are the most economical feed for sheep, for one reason especially, which is that the matter of them is perfectly digestible and there is no loss by waste in this respect. They may be cheaply grown under the right culture, which consists of a fertile soil well manured, during the Winter, or liberally fertilized in the Spring. Fall plowing is desirable as the second plowing in the Spring thoroughly fines the soil, and mixes the decayed manure—applied previously—with the soil. It is desirable to give two harrowings, one immediately after the Spring plowing, and the second in two or three weeks after, and immediately before the seed is sown, so as to check the growth of weeds as much as possible, and force a rapid start of the young plants. This is especially desirable on account of the tender growth of them, and the slight root hold taken on the soil, by which too early a disturbance of the soil is injurious to the crop, if dry weather should occur.

Six pounds of seed is sufficient, but the drill should be used for the seeding. For extensive culture, double drills are used by which two rows are sown at once. The rows should be from sixteen inches (for beets) to twenty-four or thirty (for turnips or mangels) apart, giving ample room for the use of the cultivator for working the crops. It is especially necessary that the seed should be fresh, especially as to the beets and mangels, the capsules in which the seed is enclosed frequently being eaten into by mice, and the small seed within them being eaten out. This is frequently the cause of thin seeding, by which a large part of the crop may be lost. The young plants are thinned out to twelve inches in the rows for all the kinds except sugar beets, which need but ten inches of space between the plants. The extra plants are cut out with a sharp hoe, when the

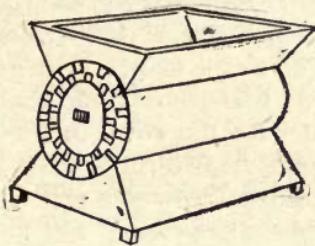
growth is sufficiently strong to prevent the injury of others to be left, by the disturbance of the soil about them. For a small crop of an acre or two, the culture may be made most conveniently by means of hand implements, seed drill and cultivator, and the thinning of the plants may be done most easily by running the hand cultivator across the rows cutting out the plants in the ten inch spaces, leaving four inches undisturbed with the plants thereon. This saves much handwork and time otherwise spent. The land needs to be clean at the start, made so most conveniently by taking a crop of corn previously, which should be carefully kept free from weeds as a preliminary to this following crop.

Before the plants meet in the rows, the leaves covering the intermediate spaces, culture may cease, and the crop will take care of itself. When ready for harvesting the crop is gathered in the following manner: With a sharp hoe, ground to a fine cutting edge, one goes down a row chopping off the tops and drawing them into the row in which he is walking. He returns up the next row cutting the tops in the same way, thus gathering the tops of two rows into one.

Another goes through the rows following the first one, and with a blunt, three-pronged hook, draws out the roots and leaves them in the vacant row next to that in which the leaves are gathered. Returning as before described, the workman takes the next row leaving the roots with those in the previous row. Thus there are double rows in the field, one of the tops and one of the roots. It is best to do this work when the land is dry, and the roots are clean and free from excess of soil. The tops are gathered and may be heaped in the field on high ground, where water will not lodge, and covered, first with straw and then with soil, sufficient to preserve them from a possible frost. The roots are gathered in the same way and so protected until they may be finally taken to a cellar or put away in pits in the field. This is done by heaping them in piles of ten or twenty bushels, and covering them with straw, and then with soil sufficient to protect them through the Winter. Eight inches of straw and the same of earth over this will serve to keep them safely.

Roots improve by keeping in this way through the Win-

ter, losing some of their moisture, and, ripening completely, become more nutritious as the season advances. In feeding them they should be sliced or pulped in a suitable machine made for the purpose, and to be procured of the dealers in farm implements. A very useful machine may be made by any ordinary mechanic in the way here shown. The frame consists of a receptacle for the roots on the top; under this is a wooden roller fitted into a round case; under this roller is studded with chisel-shapes points of steel, set with the bevel up and in rows three inches apart. These work in between the other points set in the curved frame as shown in the opened end of the machine. The space under the roller is open to let the roots come in contact with these



ROOT PULPER.

pointed scrapers, which tear the roots into pulp as they are drawn between the moving and the stationary pointed chisel-edged scrapers; the pulp falling into the receptacle beneath, whence it is shoveled into baskets to be carried to the sheep which are fed in troughs. A crank handle is of course fitted on the end of the shaft of the cylinder, which is left exposed in the drawing to show the manner of fitting the machine. By furnishing both sides of the outer cylinder with these scraping stationary teeth the machine may be worked either way. A full grown sheep will eat twenty pounds of this pulp daily when fully fed.

The most desirable other roots are the common white globe turnip for the first feeding, the ruta-baga for the next feeding. Of the mangels, the long red is the most productive, twenty to thirty tons per acre being easily produced under good culture. Lane's American sugar beet is the preference of the author, who has grown as much of it as of the long red mangels, and roots of twenty pounds each,

the sugar content of which has averaged twelve per cent, thus making this root a most valuable one both for quantity and nutritive value. Under the high culture of the best English, and indeed some American farmers, the long red mangel has produced fifty tons to the acre, and considerably over at times. The yellow globe mangel is preferred by some, but is not so easily grown as the long red variety, which has made roots weighing seventy pounds each at times.

ENSILAGE.

The introduction of the silo made some twenty-three or four years ago, and of which the first mention was made by articles in the American Agriculturist by the author, has practically revolutionized the Winter feeding of cattle, and equally may do so for sheep. For as this bulky food is specially adapted for ruminating animals, the sheep is equally interested with the cows in this vast improvement in the fodder supply. This term is fully justified by the fact that silage will feed one cow per acre of land for a winter under ensilage crops, at the least, and twice this is possible. This being so, it follows that one acre of land should be able to feed twenty-eight sheep a whole winter, taking the average equalization of seven sheep being fed as easily as one cow. But on the most reasonable figuring, these results may be safely calculated upon.

One acre of good corn ensilage will yield fifteen tons, or 30,000 pounds. Ten pounds a day will make a good ration for a sheep, so that one acre will afford three thousand rations. Feeding two hundred days in the year there is a supply for fifteen sheep for a long Winter. A two hundred pound sheep will eat one peck of roots a day, which is fifteen pounds, and twenty pounds a day is heavy root feeding. But roots have an average of about ninety per cent of water in them, while ensilage has only an average of sixty to seventy per cent and some times less than this. So that we may figure on one-fourth less ensilage for a ration than of roots, and this of course adds to the feeding value of the ensilage.

The practice of ensilage is based on the fact that any green fodder, solidly packed into an air tight receptacle, un-

dergoes a process of fermentation, by which considerable heat is produced. That in this development of heat a large quantity of carbonic acid is formed, by the fermentation of the moist vegetable matter. That carbonic acid, being considerably heavier than air, it forces or lifts the air contained in the silo among the fodder, with which it is filled, quite out of the mass, and thus practically seals it against the future entrance of air, and thus once the fermentation is completed the silage is preserved for an indefinite time. When the author studied this matter of ensilage at one of the great French sugar beet farms connected with a sugar factory, the leaves of the beets were then being packed into a silo, then a mere pit in the ground, as they had consisted of during more than a century, or several of them, during which they had been common in parts of Europe, especially in Hungary, where they were used for preserving green corn stalks. One of these pits was opened after having been kept for three years. The leaves of the beets were taken out and fed to the oxen by which the beets were drawn to the sugar factory. And they were in the very best condition of preservation, only having a brown color, as the result of the heat by which they were partly cooked. These leaves were eaten with avidity by the cattle, and it was their staple food for the year round. This ensilage was called brown hay.

Since then these simple pit-silos were greatly improved by the European farmers, especially by those of sufficient means to build expensive stone structures, with cemented pits at the bottom of them. But the Yankee—always ahead of the world—soon improved on this process, which made sour ensilage only, by securing perfect isolation from the atmosphere by which the acid of the silage was produced. We owe the discovery of sweet ensilage to Prof. Miles of the Michigan Agricultural College, by whom the completely air tight silo was invented, and this discovery has been of such importance to our agriculture as to have made the discoverer entitled to the thanks, if not more substantial reward, of the American people.

Since then the silo has been simplified, and made more useful, the device of the round or tub silo having been the last addition to the process of ensilage. This silo is by far

the most economical and sensible. It is a mere circular tank of any size that may be desired, made of two-inch staves fitted together as a barrel is, by beveling the joints and binding the staves tightly together by strong iron hoops provided with screw bolts by which the bands are drawn together.

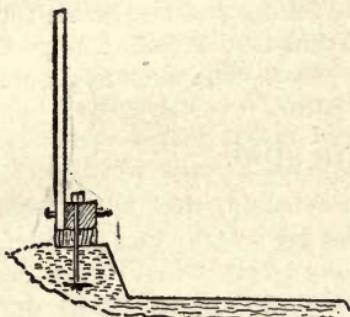
It is an easy matter to construct a silo of this kind in this way, and much better and cheaper than the ordinary square or oblong one. As the principle of the construction is the same under all circumstances, only this kind will be described.

This principle is that the silo must be free from moisture and entirely air proof. The principle on which the silage is made is that it should be packed into the silo as tightly as possible, so that as little air may be included among the silage as can be avoided. The silage should preferably be cut into small pieces or shredded, to secure this indispensable compactness. Under whatever circumstances a silo is made, or used, these indispensable conditions must be secured.

The round or tub silo is made of narrow staves six inches wide, and two thick. The edges of these are beveled to the necessary angle to make an exact fit of the edges of the staves, precisely as is done in making a tub or barrel. It will be evident that each side of each stave should have just such an angle or bevel as will fit tightly and evenly along the edges. The most convenient size for keeping the ensilage is fifteen feet diameter, which will make it forty-five feet in circumference, or as near this as is practicable. There will then be ninety staves in the circle, and as there are three hundred and sixty degrees in a circle it follows that four degrees must go with each of the ninety staves. This equally of course makes two degrees of bevel on each edge of the stave. Any one, even if little skilled in carpenter work, will be able to lay off this bevel on the edge of the staves, and they are then ready for setting up.

Necessarily the foundation is of the greatest importance, for this must be water and air tight. It is best made of cement in the shape here shown. The foundation should be dug out two feet or so but it must be made in dry ground, otherwise it is well to lay two rows of drain tile across it to avoid any burst of water up through the bottom.

The bottom and the side of it are then cemented with water lime, and three parts of sharp, clean sand, laid at least three inches thick and up the edge and under the sill, which should be safely bedded in the cement, or well mixed mortar of lime and sand, with an equal quantity of the cement with the lime. The sill may be eight inches wide and three thick, with a second one laid on this four inches narrower. To secure the foundation a bolt is built in the concrete or cement, as shown, with a broad washer on the bottom of it, and this bolt should pass through both the timbers of the sills, as shown, the sills being screwed down by the nut on the top of the



FOUNDATION FOR A ROUND
SILO.

upper one.

The staves made of dry, sound, 3x4 inch pine, are then set up. They are supported at first by stays in the inside, and outside as well, besides being bolted to the upper part of the sill. The sills are of course cut in rounded sections, to make the circle desired.

When the staves are set up and secured against falling, a hoop of two-inch iron, half an inch thick, and bent to the curve in a tire setter, as for a tire, is fitted on three feet from the ground supported in any convenient manner in their place, until they are drawn together by bolts and flanges made at each end of each strip. As soon as the first is fitted the next is put in place, four feet above the first one, and secured in the same manner. This is done to the top where the last one is placed four inches from it.

As the staves are set up, those where the doors will come for emptying or filling the silo are cut out of each stave in such a way that, being held together by strong bands, they will fit in and may be taken out as may be needed. Or they may be hinged if desired in any convenient way, but opening inside.

The doors should come between the bands, so that they do not interfere with them in any way. Of course the

doors must be carefully fitted so as to preserve the conditions required in the silo.

A conical roof is put on, and the thing is complete. It is a desirable plan to build this silo in the corner of the barn or feeding shed, so that the silage may be thrown out, and two rows of doors, one outside for filling, and one inside for taking out, may be put in for convenience of use. The roof must of course be rain and snow proof. The outside should be painted two coats of the iron paint.

FILLING THE SILO.

Corn grown, as mentioned previously, that is in rows three feet apart and spaced in the rows eight inches apart, is the best crop for ensilage. It may be cut when the grains are glazed or left to fully ripen, and if they are partly dry it is in no way hurtful. If they have been nipped by a frost or are too dry for the full degree of heating and fermentation, they should be wetted freely when they are put into the silo, and trampled down as firmly as possible, especially around the edge of the silo so as to force out as much of the air as possible. It will be a saving of the top of the silage if it is covered for a foot or two with dry chaff or cut straw. This will absorb the dampness escaping as the silage heats, and ferments, and save the top for a few inches which would otherwise mold by the action of the escaping heat and dampness.

Any green crop may be ensiloed. And it is a good way to use surplus straw to cut it and pack it in with the green stuff, either mixed or in layers. Dr. Voelcker, in his experiments made for the Royal Agricultural Society of England, found that this mixture of straw, even in a barn mow, with quite green clover or other similar stuff, in layers of a foot of each, has been so favorably acted upon by the moist heat that the whole has cured perfectly, and increased the straw in feeding value to an equality with the clover. Thus by this method, a commonly wasted product may be utilized by the silo with much economy. In taking out the silage for use it is not necessary to cover the fresh surface, as this has been cured so thoroughly by the heat of the silo as to keep in good condition until it can be used for the feeding.

Sheep must not have sour food; but the little acidity

occurring in a silo, even only moderately well managed, is not injurious to them. The common ration of ten pounds a day for a full grown sheep would be equal to seventy pounds a day for a thousand pound steer or cow, so that about six pounds a day for an average sheep will be generally sufficient along with such dry food as hay or oat straw, or any of the dry fodders. Too much silage is apt, as roots will, to keep the sheep dirty on account of the looseness always due to succulent food. Silage thus made will have grain enough to make a full ration, without other grain food, except a handful of bran to counteract any possible looseness of the bowels.

FEEDING LAMBS.

The following letter from the facile pen of Jos. E. Wing of Ohio, tells a pleasant and "ower true story" on this subject of feeding lambs. It appeared in the columns of the American Sheep Breeder, quite recently, and doubtless it will be read with interest and profit to all concerned:

"Apples of gold in pitchers of silver!" That is the pleasing characterization of "words fitly spoken" made by one Mr. Solomon some years ago. When is a word more fitly spoken than when one man tells another that his honest efforts are appreciated and his good intentions recognized? Thanks, kind friends, for your generous esteem, and thanks, genial editors, for your rather unprofessional way of letting one reader say kind things of another.

Let me see, "where was I at?" Well, when last I wrote we could not turn in any direction on Woodland Farm without seeing sheep and lambs, Montanas in the big barn, ewes at the little barn and white-fleeced lambs playing in the alley ways and munching their corn meal and bran in their feeder.

Now they have all gone to Buffalo, the drafts have all come back and gone to bank, and it is time to take account of profits. For there are profits, this year, as nearly every year, while we have not grown suddenly rich the balance is on the right side of the ledger. We like to tell of the best things. Our best was a small matter, little considered, and given little time or attention and from which little was expected. Its outcome was a surprise to us.

Here are the details:

21 lambs, weight 1280 lbs, price \$5.75.....	\$73.60
22 ewes, weight 2480 lbs, price \$3.60.....	89.28
24 fleeces	24.00
	<hr/>
Expense—24 ewes at \$3.....	\$72.00
5 tons hay.....	20.00
100 bushels corn.....	25.00
1 ton wheat bran.....	12.00
	<hr/>
Balance profit.....	\$57.88

Two of these ewes died and I kept at home some of the ewe lambs, so that the real profits are greater than these figures, but these are the actual sales thus far, and there is no guess work, as the ewes actually went with their lambs to market, only I have guessed a little as to the amount of hay and grain consumed, as they were fed along with the other ewes that have not been sold, but I think that I have allowed very liberally for the amount of food eaten.

Now it is literally true that this lot of stuff did not receive twenty minutes a day of attention. A self-feeder was kept filled with corn meal and wheat bran and to this the lambs went at will, and the ewes were mainly fed on clover and oat hay and ear corn thrown to them in their hay mangers, which are the ones that have troughs in combination. A little oil meal was given the lambs and I think that it was a decided benefit, and have not charged it to them, because I am confident that I have charged them with too much of other things, and I do not know just what amount of it they ate. These lambs were dropped in March from common ewes with a dash of Shrop blood in some of them and were sired by our Dorset ram, Alan. They have made us more money than the earlier lambs dressed at home and sent by express to New York, when the trouble of dressing and shipipng is taken into account.

If these profits are much less than sometimes reported, let us remember that days of great profits on small transactions are, perhaps, about over in this world.

I am sure that the fertility left on the farm by these sheep, as by all our sheep, much more than paid for the trouble of caring for them.

When the last of the fat lambs was on the car and before the draft could get back to vex us we threw our cares

and old overalls in the corner of the woodshed, gathered up our fishing-tackle, blankets and "tarpaulin," raided the wife's stores for a few loaves of bread, a hunk o' bacon, not forgetting frying pan and coffee pot, and away for the rushing stream and a few days of the dear old camp life.

What a delight it all was! We felt like boys out of school; the miles of lovely Ohio fields flew past, and before nightfall our little tent was pitched by a great rock under the green lindens, and across the tiny meadow of the glen the river gurgled and splashed with constant soothing. What a rest it was. How the tense and ragged nerves relaxed, and the spirit ceased to chafe the flesh or reproach it for lack of energy. What a sense of peace pervaded the rock-walled glen. To lean against the cliff inspired one with calm. Here was something changeless, something that one could bet on, not up to-day and down to-morrow, like a confounded market. How we clambered up and down the rocky trails wondering with the old wonder at the deep pools of green water, at the fallen rocks crowned with green shrubs and sturdy hemlocks. How we caressed the clinging ferns, anchored each one in its rift of stone. How we threw flies in the deep pools, each one holding a prodigy of a bass if only we could have "luck." How we caught, at least some of them, and how we made the dear old-fashioned camp fire and fried the bacon and fish as in our younger days, and then the dear, weak, smoky, old-fashioned coffee without cream, drank steaming hot from tin cups, and the lying on our blankets under the stars, the camp fire burning low, and the old memories of happier days when the blood of youth coursed swiftly through our veins. The jokes we told! The songs we tried to sing (with voices cracked, some from calling sheep), and how we lay in our tent awake long hours of the night listening to the murmuring river and wondering why Mother Earth was so much more solid-meated than she used to be, or our bones so much nearer the surface, and then in the early dawn how the little wrens called to each other along the cliffs and the vireos and warblers and all the rest of the woods' crew told their pleased expectations, and how we arose at sunrise and felt refreshed and glad that we were alive and that we were on this dear, dewy, delicious green old earth! Oh,

brother shepherd, I assure you it will pay you to get away from your work and your cares now and then. Don't go to the cities, either, reeking with bacteria and stale beer, pervaded with avarice and bunco men. Why, I got home yesterday, and am at least three years younger than I was last week.

And, now what? Why, we will do it all over again, of course, and try to do better. Already we have our first loads of alfalfa hay in the barn and are planning to get 150 or more after it. And it shall be cut early and the leaves shall all be on it, and it shall be nicely cured and smell sweet enough to scent my lady's handkerchief. And the corn, too, it has been dressed with many a load of manure from the sheds, and when summer days come we shall keep the ground loose and the weeds out and it will, I am sure, grow and yield the big piles of white and yellow ears, and every one of them almost shall slip down some lamb's throat. For lamb feeding is our chosen profession, and no tales of profits to be had from the feeding of cattle or swine shall tempt us to "try our luck" at one thing or another. No, the man who jumps after the departing train, is apt to fall in the ditch rather than into the velvet-lined seat that he desires. Lamb feeding may not be more profitable than other branches of stock feeding, but it is not, on the whole, less profitable and it is a science that is learned, generally, at the cost of some dear experience. Now that I am a shoemaker, I shall stick to my last.

Last year, dating our year as we do from the day the last lamb is sold, we fed 625 sheep and lambs for mutton and kept besides something like 100 ewes of good blood with their lambs. Besides this stock we had some 12 cows and 10 horses, and perhaps on the average 15 head of swine. Except some summer pasture hired, Woodland Farm of 200 acres has fed all this stock and carried over this year some 40 tons of hay and 600 bushels of corn. We bought a few tons of clover hay, but sold more than as much of other hay. The careful saving and applying of manure did it. Also each year we find the farm producing more of this manure, and for all that I can see this increase will be constant from year to year. That is, the more the farm is fed the more it will produce, and the more sheep it will feed,

and the more we will have to feed the farm with, to feed more sheep, to feed more acres of land, to grow more to feed the sheep, and so on, to end—where? I care not how far the process goes on. I get a small margin of profit from each mouth that the farm and I fill.

What do we grow for stock food? Corn, clover, alfalfa and oat hay.

What do we like best for a forage crop? Alfalfa. Our land is not all dry enough or fertile enough to grow it. Next and everywhere available comes red clover. Oat hay, if cut when in bloom, is very good indeed and will make milk in ewes or fatten lambs. We seed our clover and alfalfa with oats and mow for hay, and thus far have not failed to get a good stand. We use no grain but corn for fattening, but like oats for thoroughbred lambs or ewes.

The intensely practical character of Mr. Wing is in no way clouded by his love of a pleasant rest, and it savors of ancient times, when the shepherds rested under the shade of a spreading beech, and sang songs and made love to the shepherdesses, whose hands carried the crook, and whose care for the tender lambs is set forth so picturesquely and pleasantly in the old school book of the Latin poets, which every shepherd boy should study, not only for the accurate pictures of ancient shepherd life, but as well for the valuable details of the good management of a flock. It may not be out of place in these more serious and essentially practical pages, to recommend every shepherd, old or young, to procure and study these ways of the old Roman shepherds, who certainly are able to tell us much of present interest on the subject of the shepherd's pleasant and profitable occupation. It brings us into love with a sheep.

It will be noticed that the figures given by Mr. Wing include the original cost of the ewes in the account, and this cost is of course to be added to the profit. The experience of the author in feeding lambs, goes to show that this statement is really under the possible figures of profit, and it is to be considered that to a farmer, the considerable quantity of the best kind of manure made is quite sufficient to pay well for the time and care spent in the keeping of a flock.

FEEDING LAMBS IN A CORN FIELD.

There are many wastes on a farm that may be gathered up by a flock of sheep. All these count then to account of profit. One of these wastes that is worth many dollars, not only for the feed gained, but for the comfort and shade in the latter days of the Summer, when the sun's burning rays bear hard on the wooly coats, is the sprouts from the roots of the corn, the suckers as they are commonly termed. These are eagerly gathered up by the lambs, newly deprived of the company of their dams, and being weaned. These lambs wander in the comfortable shade, nipping here and there, and feeding well on this agreeable and sweetly succulent food. It is well to bell a few of the lambs, for the old rule of the shepherd, careful against accident, to "count your sheep at least once a day, and every time you see them," and this soon becomes such a fixed habit that one spontaneously complies with it without thinking of it, is to be followed constantly. For one lamb or two may become loose behind and the flies may blow them, and this is so almost hopeless a case if neglected, that the lamb, or the ewe either, may perish miserably before it is suspected, becoming a living prey to those devouring pests. Lambs on this account should invariably be docked when two weeks old. This is done with the greatest ease, as well as their emasculation at the same time, by the use of a pair of sharp shears. The lamb is taken under the left arm and held so that the skin, being drawn back, the tail may be clipped off at one cut. Then the lamb being taken between the knees and the scrotum being held conveniently is wholly clipped off, the rather rough cut being a preventive of bleeding. A pinch of blue-stone, finely powdered, carried in a pouch at the shepherd's side applied to keep off the flies, and stop any bleeding, and heal the wound, completes the operation, which is done several times in the time the lines are written.

If the lambs bite one of the lowest ears of the corn it will do no harm to it, and the owner will never miss it.

REARING HOUSE LAMBS.

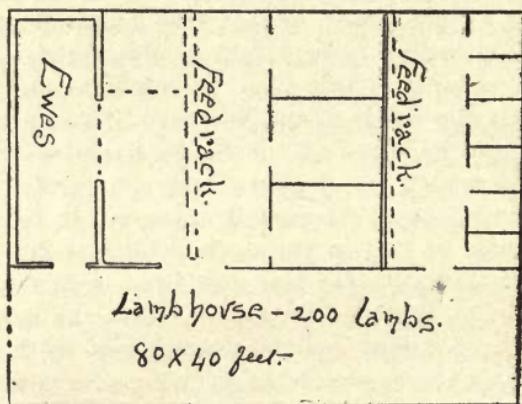
Of late years a large market has been made in the large cities for early lambs. Formerly these were not able to be

produced before late in February or March, when at the beginning of the business, it was easy to get ten dollars for a forty pound lamb live weight. The demand for the Easter festival first brought on this industry. The forward ewes were highly fed at the end of Summer and coupled in September, which is quite possible by high feeding, both ewes and the rams, for both must be forced. The demand has grown to considerable proportions of late years, and has led to the use of Dorset ewes, as the lamb bearers; these sheep having a habit of taking the ram at any time of the year. The high prices paid will return the cost of the ewe up to the time of selling the lamb, and for her feeding, and a hundred per cent profit besides. This is well worth the attention of all concerned, within two hundred miles of a city, or indeed within twenty four hours of the market, as the weather permits of this time for shipment and delivery. So that nearly the whole of the Northern States, a large part of Canada, and as much of the South, may be included in the region in which this business may be carried on. The Southern States may be especially favored, in this respect, for lambs may be had in the open field, and fed and prepared for market with far less cost than in any other part of this continent, while in the colder North the more expensive method of house rearing, sometimes with artificial warmth, may be needed for the growing of the lambs.

It goes without saying that there is more profit in selling a lamb at eight weeks old, than one at as many months. And this is the most prominent fact in this case. The method practiced is to breed the ewes (the Dorsets come first in this choice of ewes) at the required time, and keep them and the lambs in suitable houses, well provided as to convenience and healthfulness, feeding them—forcing them in fact—to the highest milk product by rich food, and if needed by artificial warmth so that the lambs make a rapid growth, and become fat for sale at the opening of the market, when of course the first offered bring the highest prices. The market opens a short time before Christmas, when the first demand occurs among those who can well afford all the luxuries of life. It is a fact to be considered as indisputable, that it pays best to cater for this class of purchasers, who spend their money without counting it,

on the principle that "easy comes, easy goes." And of late a good many flocks have been started to supply this increasing demand, in all the large cities.

The kind of house required is one of good size divided into a number of pens, in which the lambs are kept. It is a lamb house in fact, for them alone, the lambs being put in it with the ewes for a short time until the ewes are well acquainted with their business, when they may be fed in another house, or if not too costly a matter the ewes and lambs may be confined in the same house. The pens are arranged in rows, with broad alley between them. Here the ewes are fed while the lambs are kept in the pens. The

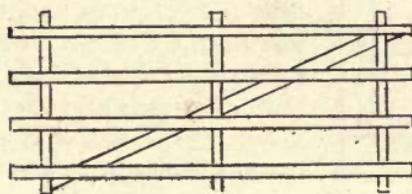


drawing given shows a lamb house in which two hundred lambs may be kept. The building is eighty by forty feet, with an additional shed in the front, half the width, of the main shed. It is scarcely to be recommended to undertake the hot house system, with artificial heating, unless one is sure of such a market for the lambs as will justify the cost of the building, and heating apparatus, which should be supplied by steam rather than by any other method, on account of the safety of it. The cost, however, is too great for the ordinary lamb grower, whose products will sell later at a less price, but with a far less cost and more profit. This house will be found amply suitable for a Southern location, where the temperature is never too severe for the safe rearing of lambs coming even in December, or so much earlier as to be sent to market in this month. A lamb is really a

hardy animal, and if sheltered from the cold winds and rain it will withstand a low temperature keeping warm and comfortable by nestling together in their woolly coats.

In the house shown, there are two rows of pens for lambs at one end, and a long pen for ewes with new-born lambs which should stay with the dams a few days, until fully hardened to the separation. This ewe pen is forty by twenty feet, and has a hay rack around three sides. It will hold a hundred ewes without crowding, by the use of the adjacent space which is divided off from the rest of the house by hurdles. This easy kind of fencing is shown by illustration, and it may be moved about without difficulty and set up by wiring the ends together by a loop. If set in straight rows the lower ends of the stakes are pointed and driven down into holes made by an iron bar in the earth

floor. They may be set as shown in one place in double rows, thus forming an excellent feeding rack for hay. The shepherd will very soon find ways to adapt the principle on which this house is constructed to his special needs



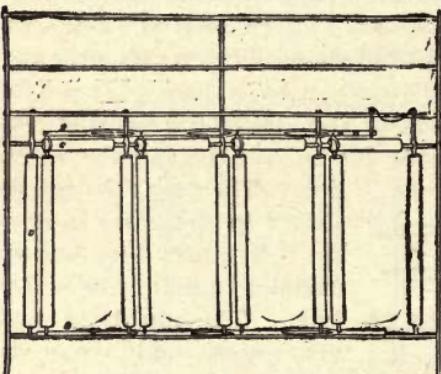
HURDLE.

and vary the arrangements to suit these. By providing feed racks in the addition to the house, in the manner of a shed, with a low sloping roof, a considerable addition may be made to the capacity of the house.

At times it is necessary to hold the ewes for the lambs to suck, and while it is generally the case that the shepherd knows his sheep—by their complexion as one once said—yet it is desirable to mark them in some easy way. This is done by numbering the ewes and their lambs with a red stamp on the right ear, so that in case of need the ewe and her lamb may be recognized. The instinct of a ewe is so acute, however, that she will easily find the lamb by the scent of it. It is quite frequently the case, however, that a ewe will be quite neglectful of the lamb, and to insure the due attention to the lambs, is by far the most important part of the shepherd's business. Constant attention is the secret of rearing early lambs if profit is expected.

FEEDING GRASS LAMBS.

When the lambs are weaned they must not be neglected. Anything neglected brings all concerned to shame, as the proverb says very truly. And a newly weaned lamb will be a sorry object if treated with neglect. It is desirable to feed the lambs before they are weaned, and while pasturing with the ewes. Some little grain food, as chopped oats with as much bran, should be given them in a creep in which a shallow trough is kept with a moderate allowance of the



A LAMB CREEP.

grain food. The creep is a useful contrivance by which the lambs may squeeze themselves through bars held by springs, and on which rollers are put to avoid tearing the fleeces. The rollers are arranged with springs, and a slot in which the ends slide, so that they open under the pressure of the

lambs, and close when they have passed through. Constant watchfulness is needed to avoid the possible occurrence of looseness of the bowels, which is an indication of indigestion, and waste of food, but still more of a rapid loss of condition, by which the growth may be set back a month or more, thus destroying the profit of the feeding. A lamb must be kept continually growing. It is this steady advance that counts. Fits and starts, and frequent stoppage, must not be permitted, and it need not be if due care is given.

An instructive record of the feeding of a large lot of lambs is given by Mr. John E. Law of Colorado. He writes: "Last winter I made something of a comparative test with three classes of lambs—a good sample lot of Mexican lambs, a lot of native Colorado Shropshire lambs (bred by my neighbor, J. A. Slayton), and my own native bred Colorado Delaine Merinos. On Dec. 3d the whole number was weighed up and put in pens of about 500 each:

502 Mexicans, averaging.....	54½	lbs.
498 Second Merinos, averaging.....	43	"
499 Top Shrops, averaging	58	"
500 Top Merinos, averaging.....	52 1-5	"

WHICH LEFT A MIXED LOT OF

175 Mexicans, averaging	47 8-10	"
71 Merinos, averaging.....	32	"
242 Shrops, averaging	44	"

From this time on all the lambs had all the alfalfa hay they could eat; and commencing with a very light feed of grain, the grain feed was gradually increased, so that by January the three pens of large lambs were eating 4-5ths of a pound per head per day, with the smaller lambs fed not quite so much. By Feb. 1st the grain ration had been increased, to about an average per day per head of 1 3-10 lbs. for the top Shrops, 1 2-10 lbs. for top Merinos and Mexicans, and 1 1-10 lbs. for each of the two lots of smaller lambs. And by March, the feed was raised to 1 6-10 lbs. for top Shrops, 1 3-10 lbs. for top Merinos and Mexicans, and 1 2-10 lbs. for each of the smaller lots. This last amount of grain was the ration fed until the lambs were marketed. Through the whole feeding they had their grain three times per day; and the grain was corn morning and evening, with oats at noon, until Feb. 11th, after which it was corn three times per day.

From Dec. 3d to Jan. 4th, the Mexicans gained an average of 8 1-10 lbs., the top Merinos 8 5-10, the Shrops 8 8-10, and the second Merinos and mixed lot each 7 1-10 lbs. The gain from this date to Feb. 2d, was: Mexicans, 8 2-10 lbs.; top Merinos, 7 6-10; top Shrops, 9 6-10; 2d Merinos, 8; and mixed lot, 9 lbs. Feb. 2 to March 3d the gain was: Top Mexicans, 7 5-10 lbs.; top Merinos, 9 3-10; top Shrops, 13 9-10; 2d Merinos, 8 8-10; and mixed lot, 9 1-10 lbs. The next weighing was April 1st, which was just following several days of stormy, wet, bad weather, and shows a less gain: Top Mexicans, 7 7-10 lbs.; top Merinos, 7 6-10; top Shrops, 8 3-10; 2d Merinos, 7 5-10; and mixed lot, 7 2-10 lbs. This made a gain of from 32 4-10 for the second Merinos to 40 6-10 for the top Shrops from Dec. 3d to April 1st—an average net gain, for the whole lot fed, of 33 4-10 lbs. Of the Shrops, 558 were sold in Chicago, April 14th, 421 of which averaged 97 lbs. and sold at \$6.10, while 137 averaged 86 lbs. and sold at \$6—this being 15 cents above the price paid

for any Mexicans that day. The mixed lot was sold in Chicago April 26th, when the balance of the Shrops and the small end of the Mexicans were sold separately, both bringing ten cents below the top price paid for Mexican lambs that day, while the extreme small end of the Merinos sold very considerably below. April 27th, the second Merinos were sold at 20 cents below the top price for lambs that day.

The top Mexicans and top Merinos were fed until May 15th, to which date from the first of April both lots made an average net gain per head of 2-10 lb. per day. The Merinos were sold in South Omaha, April 17th, weighing there an average of 89 lbs., and bringing a higher price than had been paid for lambs in that market before that day. The Mexicans were taken on to Chicago, but would have sold in South Omaha at 10 cents higher than the Merinos did the same day. The Mexicans were sold in Chicago, May 20th, averaging 89 lbs., bringing 22½ cents below the extreme top price of the day, principally on account of their heavy weight.

The average shrink of whole lot marketed from home weights was a trifle under six pounds. In my experiment, the Shrops made the greatest gain of all, while the Delaine Merinos kept fully up to the Mexicans, with, as near as it was possible, the same feed and care."

One point of interest in this record should not be missed. This is that these lambs were cross-breds, and as a rule it has been found that by making the right cross a considerable gain may be made over that usual in the ewes used for the cross. The choice of the rams for the crossing on the ewes is therefore of the greatest importance in the feeding of lambs.

EXPERIMENTS IN FEEDING LAMBS.

Some interesting experiments made in England in feeding lambs may be noticed. Eight lambs were put in each of eleven lots, and fed as here described, making the gain set against each lot.

Lot 1. Consumed 23½ lbs. of turnips per day, and gained in fifteen weeks 25½ lbs. each.

Lot 2. Put on grass and fed lbs. of turnips a day, gained in the same time 26¾ lbs. each.

Lot 3. Put by side of lot 2, and were shut up at night. Fed half a pound of mixed linseed oil-meal and peas, daily, ate in addition 20½ lbs. of turnips. Gain 33½ lbs. each.

Lot 4. Put on grass and fed one pound of mixed oats, barley, and beans daily. In ten weeks ate 20 lbs. of turnips daily, and gained 26½ lbs. average.

Lot 5. Put in a sheltered paddock (a small grass lot) and shut up in a shed 18 hours in the 24. Fed 1¼ lbs. of the mixed grain a day, with 18½ lbs. of turnips daily. Gain in ten weeks, 33½ lbs. each.

Lot 6. The same number of lambs were put in an open grass lot, fed one pound of the mixed grain daily, with 24 lbs. of Swede turnips. Gain in eight weeks, 21½ lbs. each.

Lot 8. The same number of lambs put in a similar paddock, with an open shed in it, and were shut up at night. Fed the same feed of grain with lot 7, ate 20½ lbs. of turnips. Gain in eight weeks, 24 lbs. each.

The principal item of interest in these tests is the effect of shelter on the lambs. This goes to prove the statement made in a previous chapter, to the effect that warmth saves food, or its equivalent that the same food, or even less, will make more gain in weight.

POSSIBLE GAIN IN A YEAR'S GROWTH.

An essay contributed to the volume of the proceedings of the Royal Agricultural Society of England, gives the following statement of the growth of lambs during a series of years in the months of a whole year from the weaning of the lambs.

AVERAGE GROWTH FOR EACH LAMB.

April.....	9 pounds.
May.....	16 "
June.....	18 "
July.....	15 "
August.....	12 "
September.....	12 "
October.....	12 "
November.....	8 "
December.....	6 "
January.....	5 "
February.....	7 "
March.....	10 "

Total gain for the year 130 lbs. live weight, for the average of the flock.

It is a fact that lambs in confinement, and restless under the restraint, never make as much growth as those that are

contented. Thus it is always desirable to this end to have a few dry ewes run with the lambs for company, when feeding, the more so, as the time of separation from their dams is short.

Other experiments in feeding lambs go to show that the selection of foods is a most important point. As for instance, an equal number of ewes and lambs were selected as of even weights, and quality, at the start. One lot was folded on clover, the latter part of May, and given in addition cut mangels and a small quantity of cut clover hay with the cut roots. The lambs had the run of a good clover field which they reached through the hurdles by which the ewes were fenced off. The second lot ran at large on a white clover pasture and their lambs run on good red clover. All the lambs had a handful of peas once a day. In 28 days the lambs of the ewes fed on the mangels gained 21 lbs.; the other lot gained 18 lbs. This gain of 21 pounds in 28 days is a remarkable instance of successful feeding, and a great recommendation of the root feeding. Mangels contain a large proportion of sugar, and are very productive of milk in both ewes and cows.

When confinement appears irksome, something should be done to alleviate the dissatisfaction of sheep, whether young or old. Here is an instance of the result of disliked confinement. An equal number of good lambs were put into a field of turnips, and inclosed in movable hurdles. The same number of lambs of equal weight and age were put into a yard with warm shed attached to it, and fed with roots from the field, and a liberal quantity of grain. In eight weeks the lambs were weighed and the lot outside in the field had gained an average of 13 lbs.; the other lot gained only 3 lbs. each. This flock was conspicuously restless, jumping the fence at every opportunity. It is an example of the adage "a contented mind is a continual feast," and the shepherd, knowing how it is himself, will take care to apply it to his flock. If the sheep desire to stay out of a protecting shed, and are happy in their choice, it is wise in the shepherd to let them have their way, unless it is clearly against the safety of the sheep. These—sometimes called—foolish animals know generally enough to get in out of the rain when they so desire.

In feeding roots to sheep, in any case, it is wise in our estimation, to stop at ten pounds a day, for a lamb under seventy pounds live weight, and less in proportion as the age is less. It must be remembered the English lambs are to the manor born, as regards the feeding of roots, and inheritance unquestionably determines the nature of a lamb in this, as in other respects. So that the American shepherd who thinks of introducing root feeding on the English system (and this should only be in the absence of freezing weather), will be wise to go slow at first, feeding his way to the safe end, which is only reached by experience. This is always applicable to special circumstances, which, we have learned, alter cases. As a rule the German and French experiments in feeding sheep from a scientific standpoint, as from results gained at the experiment stations, have never been so successful as the practical feeding on the common farm practices, existing for many years, and learned by long personal experience, and the rules laid down by the most successful feeders and scientific experimenters. Something of this may be reasonably attributed to the moister climate of England, by which the nutritive character of the grass and other feeding crops is improved, over and above those of the drier climate of Continental Europe. The same difference will doubtless be found applicable on our side of the Atlantic.

WINTER FEEDING FOR WOOL.

This is pre-eminently the age of science. In every part of the work of the human race, among whom products are cultivated under the present high degree of competition and consequent necessary cheapness, the science of every art is made the basis of practical work. This applies in a special way to the feeding of animals for their valuable products as it is applied to the culture of every farm crop. The precise composition of every product is studied out by the chemists, and their directions are made the basis of all kinds of work, in every department of human industry. This has now become the rule and it is indispensable that all concerned should live up to it, or the work cannot be made profitable. This is so for the simple reason that economy must be studied, and it

is essential to economy that no more material should be used to get the desired product of it, than is actually needed for it. Otherwise there is waste, and this is just so much loss. The result of all this is that in the feeding of our domestic animals, our horses, cows, pigs, and most of all, sheep, the modern principles of scientific feeding is the rule or must be so if the most profit is to be made.

In feeding sheep there are three things to consider. First, the animal itself is to be fed on the best kinds of food, those by which the animal may grow in the best, most healthful and cheapest manner; second, those by which the best lamb is produced; and third, by which the most and the best fleece is insured. Let us consider the last item at this time.

Every product of nature is made up of certain elementary substances, and these are to be considered as the basis and materials for the special product. If the farmer wants to grow wheat or potatoes, or other crops, he studies the kind of materials which the soil must contain for the best product of each crop. If he is feeding cows, he uses the best foods for making the most and richest milk. If he is feeding beef cattle, he uses the most nutritious foods for the product of flesh and fat; and if he is feeding sheep, he makes use of the foods that make the most growth of flesh and wool, for wool is as much a desirable and profitable product as the mutton is.

Now wool is a specially constituted product, and its special character is to be considered in the feeding of the sheep. It is made up of much the same elements as flesh or skin is. But at this time it is only necessary to notice two of these special elements, and these are the nitrogen and sulphur which wool contains. These are nearly sixteen per cent, or one-sixth, of nitrogen; and nearly four per cent of sulphur. In burning wool or hair we experience a specially strong and acrid odor. This is the result of the combustion of the sulphur, and the strength of the odor shows the considerable quantity of this element in the wool. There is no appreciable difference between the wool of a sheep and the hair of an animal; both are a kind of hair. But the sheep yields a much greater quantity of

wool than any other animal does of hair. Of course this greater product makes it necessary that the sheep be supplied with a larger allowance of these food elements than other animals, just in proportion as the fleece is greater in weight. But there is another thing to be thought of, this is the fact that the wool is naturally supplied with a greasy or waxy substance which is known as the yolk. This is indispensable to prevent matting and entangling or felting of the wool on the sheep's back, which would completely destroy the value of the fleece. So that this yolk is to be provided for, and this soapy material contains a large quantity of oil and potash which really go to make a sort of soap. We learn this fact when we wash a sheep before shearing it. And of course these materials for this large quantity of yolk must be supplied in the food.

Then we have three important substances to supply in the sheep's food that are not required in the food of other animals. It follows that sheep need special feeding if we should have the most profit from the flock. And without going into further particulars on this point we may say that the foods best suited for the flock are those in which these special elements are supplied. These foods are clover hay, rape, turnips, cabbages (all of these are rich in sulphur), and of grains, oats, peas, beans, bran, linseed oil-meal and corn; pea and bean straw may be included in the rough fodders. Alfalfa will take the place of clover, but the common grasses are all deficient in the needed special elements of the sheep's food. Thus it is necessary for the shepherd to feed a due proportion of these special foods in regard to their effect as to cheapness as compared with the common grasses, of which the worst of all for a flock is timothy. Orchard grass makes one of the best pastures after clover, but clover is pre-eminently the main food for a flock. So are the roots mentioned, and the secret of success in feeding sheep by English, French and German shepherds, lies especially in the roots grown for this purpose. This is a most important point to consider by every American shepherd. The repetition of this remark may be excused as coming from many years' experience, and the profound conviction of its positive necessity for full success with a flock.

SCIENTIFIC EXPERIMENTS IN FEEDING LAMBS FOR MARKET.

The experiment stations have exhibited considerable enterprise in originating subjects for experiment, and careful and accurate study. In due accordance with the newly awakened interest in the rearing and feeding of sheep some of the stations have instituted a careful series of experiments in feeding sheep for market, as a test, not only of the value of the various breeds, but of the various foods and general management during a lengthened period of fattening. Of these we feel chiefly interested in those undertaken at the Iowa Station under the direction and personal charge of Prof. Curtiss, and those made at the Wisconsin Station by Prof. Craig.

At the outset of his report Prof. Curtiss calls attention to the alleged widely established but erroneous belief that sheep are only good for eating weeds, on poor worn out lands, and that for this use they may be made profitable; while it is equally—and we may say consequently—thought that they are not fitted at all for feeding on the fertile farms on which, in fact and truth, they are really the most profitable stock that the best and most enterprising farmers can keep for making their well cultivated fields more and more productive. It may be said that this—let us say distinctly foolish and ignorant—idea has never been encouraged by those persons who know anything whatever about sheep, and the special requirements of them for the very best possible keeping in every way; but by a few writers who have harped on this subject until, as the proverb goes, “a lie often told is apt to be taken for the truth.” It is quite true that any competent farmer, or shepherd, well acquainted and experienced with sheep, may take a poor farm and in a short time, by the aid of a flock, bring the land into a greatly improved condition, and in due time make it profitable so that it will yield satisfactory crops of grain or grass, and this at very little cost, and sometimes without loss from the start. But the belief that any man may keep a flock profitably on weeds, or on fields bare of good grass, should be discouraged by all concerned in advancing the interests of the flocks.

Doubtless some of the failures that have been made—and which have led the disappointed persons to feel, as it is said the noted Mr. Randolph of Virginia did, when he said that he would go a long way to kick a sheep—have had their origin in attempts made to keep sheep that have been originated and encouraged by this common assertion as to the special adaptability of poor impoverished lands to the business of rearing sheep, but have failed disastrously.

In this experiment the lambs were procured from the very best sources, and while the Canadian breeders are to be complimented on the fact that their flocks were chiefly selected as the best sources from which to procure entirely satisfactory lambs for the tests, yet it should be thought by the breeders of the United States, as somewhat of a reflection on their enterprise and business test, that a sufficient number of good lambs could not be procured to supply material for such an important scientific experiment as this. The best specimens of each breed were very carefully selected, and as soon as the lambs arrived they were dipped, and during the month of August they pastured in a large meadow of timothy and blue grass, having a good aftermath.

As a preliminary the lambs were treated with turpentine and worm powders in the usual manner, not so much as a remedy for any existing disease, but as a preventive and to insure the absence of anything that might interfere with the successful issue of the experiments. It is well to know that every needed preliminary precaution to insure success was taken, so that the comparative results given may be received with certainty. It is unnecessary to give in full detail the whole of the arrangements made for the feeding of the lambs, it will be sufficient to say that every precaution was taken to prepare the lambs in the best manner for the tests, and to carry these out with true scientific exactness. The lambs were gradually led up to the full feeding with every caution, during a preliminary period of two months. It is to be considered in such an experiment as this, 'in which the lambs were frequently weighed and subjected to disturbances that must necessarily interfere with the growth—for no other animal is so easily disturbed in this way as a sheep—that there will be some allowance to be

made, which otherwise would have added somewhat to the credit of the animals subjected to these experiments. So that this must be taken into account as actually going to lessen the results of the experiments and leaving something, at least, to be really added to the credit of the lambs.

The figures relating to the final result of the experiments are given as follows, each breed being noted separately:

SOUTHDOWNS.

	1st Expt.	2d Expt
Average age of lambs.....	374 days	289 days
Average weight..... (March 31, shorn)	125 lbs.	(Jan. 1) 102.4 lbs
Average gain per day during the experiment...	.45 lbs.	.35 lbs
Average dry matter per pound of gain.....	7.38 lbs.	9.89 lbs
Average cost of feed per pound of gain.....	2.93 cts.	3.12 cts
Selling price on Chicago market.....	\$4.75	\$5.75
Average per cent of dressed mutton	55.4	55.26
Average weight of fleece.....	6.75 lbs	4.59 lbs
Average age of fleece	366 days	289 days
Average value of fleece	75 cts.	64 cts
Average yearly weight of fleece.....	6.75 lbs.	5.79 lbs
Average yearly value of fleece.....	75 cts.	81 cts
Value of wool per pound in natural condition.	11½ cts.	14 cts
Average shrinkage in scouring.....	54¼ per cent	
Value of wool per pound in scoured condition.	26 cts.	

SHROPSHIRE.

	1st Expt.	2d Expt
Average age of lambs	371 days	279 days
Average weight..... (March 31, shorn)	135 lbs.	(Jan. 1) 126 lbs
Average gain per day during the experiment...	.48 lbs.	.36 lbs
Average dry matter per pound of gain.....	7.18 lbs.	10.26 lbs
Average cost of feed per pound of gain.....	2.88 cts.	3.21 cts
Selling price on Chicago market	\$4.62	\$5.60
Average per cent of dressed mutton.....	56.3	52.88
Average weight of fleece.....	8.75 lbs.	7.83 lbs
Average age of fleece	366 days	279 days
Average value of fleece	98 cts.	\$1.10
Average yearly weight of fleece	8.75 lbs.	10.22 lbs
Average yearly value of fleece.....	98 cts.	\$1.44
Value of wool per pound in natural condition.	11 cts.	14 cts
Average shrinkage in scouring.....	56¼ per cent	
Value of wool per pound in scoured condition.	25 cts.	

OXFORDS.

	1st Expt.	2d Expt
Average age of lambs	374 days	279 days
Average weight..... (March 31, shorn)	155 lbs.	(Jan. 1) 136.7 lbs
Average gain per day during the experiment...	.52 lbs.	.40 lbs
Average dry matter per pound gain.....	7.40 lbs.	10.31 lbs
Average cost of feed per pound of gain.....	3.03 cts.	3.22 cts
Selling price on Chicago market	\$4.50	\$5.40
Average per cent of dressed mutton.....	55.2	50.08
Average weight of fleece.....	10.95 lbs.	8.03 lbs
Average age of fleece	365 days	279 days
Average value of fleece	\$1.44	\$1.16
Average yearly weight of fleece	10.95 lbs.	9.38 lbs
Average yearly value of fleece	\$1.44	\$1.51
Value of wool per pound in natural condition.	12½ cts.	14½ cts
Average shrinkage in scouring.....	47 per cent	
Value of wool per pound in scoured condition.	24 cts.	

SUFFOLKS.

	1st Expt.	2d Expt
Average age of lambs.....	394 days	285 days
Average weight..... (March 31, shorn).....	159 lbs. (Jan. 1)	134.4 lbs
Average gain per day during the experiment.....	.55 lbs.	.40 lbs
Average dry matter per pound of gain.....	7.40 lbs.	10.36 lbs
Average cost of feed per pound of gain.....	2.95 cts.	3.44 cts
Selling price on Chicago market.....	\$4.25	\$5.00
Average per cent of dressed mutton.....	53.6	52.54
Average weight of fleece.....	7.65 lbs.	5.20 lbs
Average age of fleece.....	383 days	285 days
Average value of fleece.....	\$0.86	\$0.75
Average yearly weight of fleece.....	7.29 lbs.	6.64 lbs
Average yearly value of fleece.....	\$0.82	\$0.95
Value of wool per pound in natural condition.....	11 cts	14½ cts
Average shrinkage in scouring.....	54½ per cent	
Value of wool per pound in scoured condition..	24 cts.	

LINCOLNS.

Average age of lambs.....	345 days	291 days
Average weight..... (March 31, shorn).....	158 lbs. (Jan. 1)	143.5 lbs
Average gain per day during the experiment.....	.55 lbs.	.46 lbs
Average dry matter per pound of gain.....	7.29 lbs.	9.1 lbs
Average cost of feed per pound of gain.....	2.89 cts.	2.86 cts
Selling price on the Chicago market.....	\$4.50	\$5.25
Average per cent of dressed mutton.....	55.7	51.08
Average weight of fleece.....	12.85 lbs.	10.4 lbs
Average age of fleece.....	332 days	291 days
Average value of fleece.....	\$1.79	\$1.56
Average yearly weight of fleece.....	14.13 lbs.	13.03 lbs
Average yearly value of fleece.....	\$1.96	\$1.95
Value of wool per pound in natural condition..	13½ cts.	15 cts
Average shrinkage in scouring.....	40 per cent	
Value of wool per pound in scoured condition..	23 cts.	

LEICESTERS.

Average age of lambs.....	347 days	268 days
Average weight..... (March 31, shorn).....	161 lbs. (Jan. 1)	138.4 lbs
Average gain per day during the experiment.....	.62 lbs.	.50 lbs
Average dry matter per pound of gain.....	6.53 lbs.	8.48 lbs
Average cost of feed per pound of gain.....	2.60 cts.	2.65 cts
Selling price on Chicago market.....	\$4.50 cts.	\$5.25 cts
Average per cent of dressed mutton.....	54.9	53.57
Average weight of fleece.....	12.65 lbs.	9.8 lbs
Average age of fleece.....	334 days	268 days
Average value of fleece.....	\$1.66	\$1.46
Average yearly weight of fleece.....	13.82 lbs.	13.32 lbs
Average yearly value of fleece.....	\$1.81	\$1.98
Value of wool per pound in natural condition..	13 cts.	15 cts
Average shrinkage in scouring.....	43½ per cent	
Value of wool per pound in scoured condition..	23 cts.	

COTSWOLDS.

Average age of lambs.....	362 days	277 days
Average weight..... (March 31, shorn).....	167 lbs. (Jan. 1)	133 lbs
Average gain per day during the experiment.....	.52 lb.	.44 lb
Average dry matter per pound of gain.....	7.49 lbs.	9.34 lbs
Average cost of feed per pound of gain.....	2.93 cts.	2.93 cts
Selling price on Chicago market.....	\$4.50 cts.	\$5.25 cts
Average per cent of dressed mutton.....	57.8	51.87
Average weight of fleece.....	11.55 lbs.	8.9 lbs
Average age of fleece.....	348 days	277 days
Average value of fleece.....	\$1.76	\$1.33
Average yearly weight of fleece.....	12.11 lbs.	11.71 lbs
Average yearly value of fleece.....	\$1.85	\$1.71
Value of wool per pound in natural condition..	14½ cts.	15 cts
Average shrinkage in scouring.....	38½ per cent	
Value of wool per pound in scoured condition..	24 cts.	

DORSETS.

	1st Expt.	2d Expt
Average age of lambs.....	367 days	277 days
Average weight.....(March 31, shorn)...	138 lbs. (Jan. 1)	128.3 lbs
Average gain per day during the experiment...	.48 lb.	.43 lb
Average dry matter per pound of gain.....	7.85 lbs.	9.89 lbs
Average cost of feed per pound of gain.....	3.05 cts.	3.04 cts
Selling price on Chicago market.....	\$3.75	\$5.50
Average per cent dressed mutton.....	52.6	54.11
Average weight of fleece.....	6.83 lbs.	5.97 lbs
Average age of fleece.....	355 days	277 days
Average value of fleece.....	\$0.77	\$0.83
Average yearly weight of fleece.....	7.2 lbs.	7.84 lbs
Average yearly value of fleece.....	\$0.79	\$1.09
Value of wool per pound in natural condition..	10 $\frac{1}{4}$ cts.	
Average shrinkage in scouring.....	55 per cent	14 cts
Value of wool per pound in scoured condition..	24 cts.	

RAMBOUILLETS.

	362 days	255 days
Average age of lambs.....	362 days	255 days
Average weight.....(March 31, shorn)...	99 lbs. (Jan. 1)	113.3 lbs
Average gain per day during the experiment...	.29 lb.	.37 lb
Average dry matter per pound of gain.....	9.35 lbs.	10.29 lbs
Average cost of feed per pound gain.....	3.78 cts.	2.91 cts
Selling price on Chicago market.....	\$4.25	\$5.00
Average per cent of dressed mutton.....	51.8	49.57
Average weight of fleece.....	9.9 lbs.	6.60 lbs
Average age of fleece.....	359 days	255 days
Average value of fleece.....	\$1.00	\$0.73
Average yearly weight of fleece.....	10.07 lbs.	9.42 lbs
Average yearly value of fleece.....	\$1.02	\$1.04
Value of wool per pound in natural condition..	9 $\frac{1}{4}$ cts.	11 cts
Average shrinkage in scouring.....	67 $\frac{1}{2}$ per cent	
Value of wool per pound in scoured condition..	30 cts.	

These figures deserve careful study, as an example of the results of good feeding, and the profit of it when done under the best methods. The feeds given to these lambs were as follows. For the first fifteen days the ration was made up of:

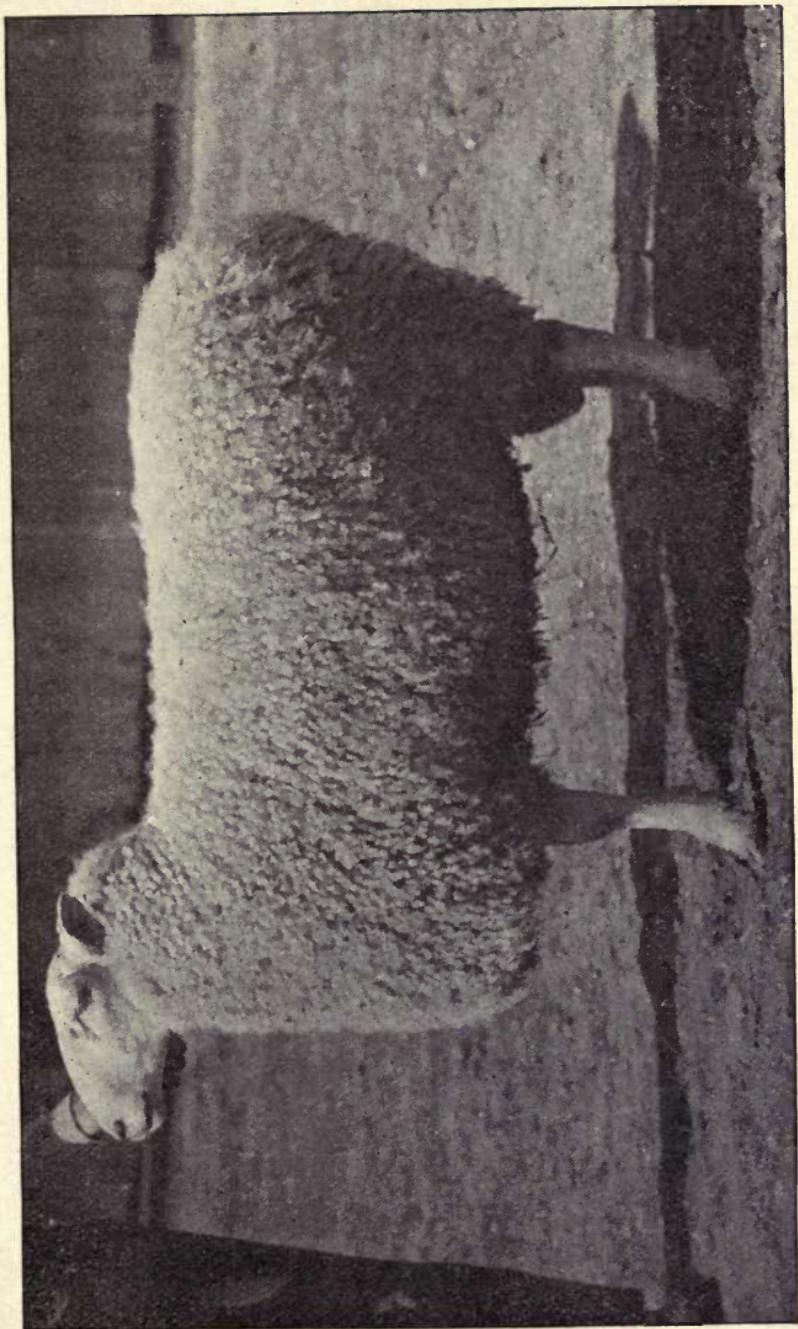
50 lbs. bran.....	Cost, 40 cents per 100 lbs.
100 lbs. oats.....	" 40 "
100 lbs. shelled corn.....	" 28.5 "

After this time the following ration was fed:

25 lbs. of oil meal.....	Cost, 90 cents per 100 lbs. .
50 lbs. of bran.....	" 40 "
200 lbs. of oats.....	" 40 "
200 lbs. of shelled corn.....	" 20 "

Towards the close of the feeding period, ten pounds more of oil meal was added to the ration, and continued to the end. Each lamb was fed as much as it would eat, and some roots and hay in addition. The hay cost 28 cents per 100 lbs. and the roots 5 cents.

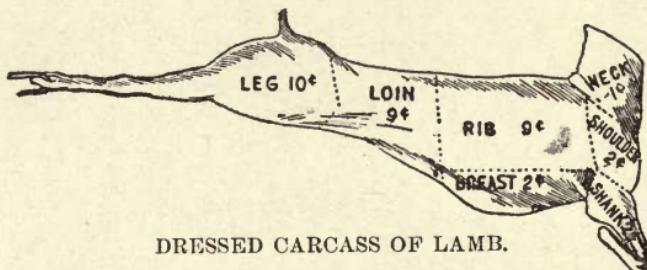
The whole number of lambs, 109 in the first experiment and 91 in the second, not including the ewes, made a total gain of 8,246 pounds from 69,134 pounds (dry matter) of feed—a rate of one pound of gain for 8.38 pounds of dry



AN AMERICAN LEICESTER RAM.
A. W. Smith, Maple Lodge, Ontario, a representative breeder.

matter in the feed consumed and an average of .448 pounds per head daily for the entire lot. The total gain of 8,246 pounds was made at a cost of \$245.69 for feed consumed, or an average cost of 2.97 cents per pound for the mutton produced in both experiments. This calculation makes no allowance for the value of the fleece, except as it entered into the gain, nor does it take into account the value of the manure or expense of labor in feeding.

The marketing of these lambs is a matter of interest as it goes to show what sort of figure the most profitable kind of sheep should possess, and gives a very good idea of what should be the aim of the breeder in the improvement of his flock, and the kind of rams—the form of them especially—



DRESSED CARCASS OF LAMB.

to be chosen for this purpose. The above drawing shows the carcass of one of these lambs denuded only of the head. The next table below gives the market values of each of these parts of the carcass to the butcher.

BLOCK TEST.

SOUTHDOWNS.

	Weight.	Per cent.	Price.	Amount.
Two pair legs.....	40	29.85	10	\$ 4 00
Two ribs	34	25.37	.9	3 06
Two loins	25	18.66	9	2 25
Two chucks	35	26.12	2	70
 Total of two lambs...134	 100.			 10 01

SHROPSHIRE.

Two pair legs.....	32	29.56	10	3 20
Two ribs	26	23.85	.9	2 34
Two loins	21	19.26	9	1 89
Two chucks	30	27.33	2	60
 Total of two lambs...109	 100.			 8 03

OXFORDS.

Two pair legs.....	51	31.87	9	4 59
Two ribs	37	23.12	8	2 96
Two loins	31	18.75	8	2 40
Two chucks	42	26.26	2	84
 Total of two lambs...160	 100.			 10 79

SUFFOLKS.

	Weight.	Percent.	Price.	Amount.
Two pair legs.....	47	29.19	9	\$4 23
Two ribs	37	22.98	8	2 96
Two loins	33	20.50	8	2 64
Two chucks	44	27.33	2	88
Total of two lambs...161	100.			10 71

LINCOLNS.

Two pair legs.....	45	30.61	9	4 05
Two ribs	35	23.81	8	2 80
Two chucks	39	26.54	2	.78
Two loins	28	19.04	8	2 24
Total of two lambs...147	100.			9 87

LEICESTERS.

Two pair legs.....	48	29.09	9	4 32
Two ribs	38	23.03	8	3 04
Two loins	35	21.21	8	2 80
Two chucks	44	26.67	2	.88
Total of two lambs...165	100.			11 04

COTSWOLDS.

Two pair legs.....	48	30.19	9	4 32
Two ribs	38	23.90	8	3 04
Two loins	30	18.87	8	2 40
Two chucks	43	27.04	2	.86
Total of two lambs...159	100.			10 62

DORSETS.

Two pair legs.....	41	30.15	8	3 28
Two ribs	33	24.26	7½	2 47
Two loins	25	18.38	7½	1 88
Two chucks	37	27.21	2	.74
Total of two lambs...136	100.			8 37

MERINOS.

Two pair legs.....	30	29.41	9	2 70
Two ribs	22	21.57	8	1 76
Two loins	22	21.57	8	1 76
Two chucks	28	27.45	2	.56
Total of two lambs...102	100.			6 78

The form and figure of any animal to be fed for profit have always been a matter of primary importance to the feeder. We are always to think of the ancient wise man's remark that the feeding of animals is the most important part of agriculture. It is so in two ways. First the profit to be made from the feeding, and second, the manure left by which the exhaustion of the soil, in producing the crops by which the animals are fed, is repaired. And so it is that the feeder of sheep must study the form of the

most profitable animals in the way of feeding for profit. A careful study of the figures above given will help very much in the choice of the stock the feeder thinks of expending his fodder and grain upon. It is equally a matter for study by the breeder, who works for the feeder, and of course must supply him with such animals as will have the most profit in them for him. The waste parts of an animal of course go for nothing, but yet they consume as much food, pound for pound of live weight, as the most valuable, and so it is that the carcass which has the most weight of the most valuable parts to the consumer, will be the most profitable to feed. In the sheep, we want the broad back with the full loins, the full ribs and deep shoulders; but the short neck and legs, which only give weight of the least useful and valuable parts of a carcass. So too we want the least possible offal inside.

Thus the figure of the carcass of the lamb given before will furnish excellent hints to the breeder for the production of the right kind of a carcass needed by the feeders, and these will learn from it how to choose those animals of which they may make the most profit by feeding for valuable meat, and not for mere bone and undesirable flesh. So, too, the table following, in which is given the several proportions of the meat and the offal of the carcass of each of the breeds named, will furnish very profitable material from the point of view mentioned, viz., the profit of the feeder, and through him, that of the breeder, who must for his own advantage consult the interests of his clients—the purchasers. This separation of interests is unavoidable; for there are two distinct purposes in pursuits; the one providing for the other; and being dependent upon him, and the other looking to the breeder for the material which he needs to make his own products more valuable. We think this separation in one sense, and union in another, of the two interests, are best for both, giving a better opportunity for two heads to work together, each devoting his special talents and opportunities to the single end in view.

The butcher's block is the final test of all and is the measure of value of the product of the skill of the breeder and the feeder as well. The following figures afford material for painstaking and intelligent study:

SLAUGHTER TEST OF QUALITY.—PROPORTION OF MEAT AND OFFAL IN GARCASS.

	10 Southdown Lambs.				10 Shropshire Lambs.				10 Oxford Lambs.				10 Suffolk Lambs.				10 Lincoln Lambs.				10 Cotswold Lambs.				9 Leicester Lambs.				10 Crossbred Lambs.				10 Range Lambs.				5 Shropshire Yearlings.			
	Wt.	¶ ct.	Wt.	¶ ct.	Wt.	¶ ct.	Wt.	¶ ct.	Wt.	¶ ct.	Wt.	¶ ct.	Wt.	¶ ct.	Wt.	¶ ct.	Wt.	¶ ct.	Wt.	¶ ct.	Wt.	¶ ct.	Wt.	¶ ct.	Wt.	¶ ct.	Wt.	¶ ct.	Wt.	¶ ct.	Wt.	¶ ct.	Wt.	¶ ct.	Wt.	¶ ct.				
Mutton	65.1	59.24	69.6	58.78	80.0	60.24	80.0	58.36	80.8	59.50	79.5	58.89	81.5	62.88	55.4	79.5	57.35	51.6	56.16	56.0	66.10	58.26	32	3.76	3.26	2.24	2.77	19	11.09	70	8.26	3.26	2.24							
Pelets	100	9.06	104.5	8.83	131	9.86	121	8.82	148.5	10.94	141	10.44	11.8	9.11	108.5	11.23	102	11.23	102	11.09	70	11.09	70	11.09	70	11.09	70	11.09	70	11.09	70	11.09	70							
Blood	42.5	3.88	48	4.05	54.5	4.11	58	4.23	57.5	4.23	55.5	4.11	53.5	4.12	42	4.35	39.5	4.29	32	4.29	32	3.76	3.26	2.24	2.77	19	3.76	3.26	2.24	2.77	19	3.76	3.26	2.24	2.77	19				
Heads	29.5	2.68	29.5	2.49	38	2.86	39	2.84	85.5	2.61	37	2.74	83.5	2.51	26.5	2.74	25.5	2.74	25.5	2.74	25.5	2.74	25.5	2.74	25.5	2.74	25.5	2.74	25.5	2.74	25.5	2.74	25.5	2.74	25.5					
Horns	4.5	.42	4	.34	5.5	.41	5.5	.41	5	.37	5	.37	5	.37	4.5	.35	4	.35	4	.35	3.5	.35	3	.35	3	.35	3	.35	3	.35	3	.35	3	.35	3					
Tongues	6	.54	6.5	.55	8.5	.64	8	.58	8.5	.64	8	.58	8	.58	8.5	.64	8	.64	8	.64	7.5	.59	6	.62	6	.62	6	.62	6	.62	6	.62	6	.62	6					
Feet	38.25	3.48	44.5	3.76	40	3.01	46.5	3.89	43	3.09	41	3.04	41	3.16	42.5	4.40	39	4.24	36	4.24	36	4.24	36	4.24	36	4.24	36	4.24	36	4.24	36	4.24	36	4.24	36					
Caul fat	3.5	.32	2.5	.22	4	.3	4	.29	3.5	.25	3	.22	3.5	.27	2.5	.25	2.5	.27	2.5	.27	2.5	.27	2.5	.27	2.5	.27	2.5	.27	2.5	.27	2.5	.27	2.5	.27	2.5					
Bed tallow	32	2.95	35.5	2.99	41.5	3.13	44	3.21	39.5	2.91	43.5	3.22	38	2.98	27	2.80	23	2.50	20	2.50	20	2.50	20	2.50	20	2.50	20	2.50	20	2.50	20	2.50	20	2.50	20					
Paunches empty	32.5	5.98	82.5	6.97	63	7.76	99.5	7.26	73	5.89	85.5	6.33	55	4.25	43	4.45	55.5	6.09	31	6.09	31	6.09	31	6.09	31	6.09	31	6.09	31	6.09	31	6.09	31	6.09	31					
Paunches fat	3.5	.32	3.5	.3	3.5	.26	4	.28	4	.29	3.5	.26	3.5	.28	3	.31	3.5	.35	3	.35	3	.35	3	.35	3	.35	3	.35	3	.35	3	.35	3							
Intestines empty	18.5	1.68	18.5	1.56	21	1.58	22	1.61	21	1.54	21	1.56	18	1.59	25.5	1.61	21	1.54	21	1.56	18	1.59	25.5	1.61	21	1.54	21	1.56	21	1.54	21	1.56	21							
Intestines waste	3.64	41.5	3.51	47.5	3.58	49.5	3.61	45.5	3.55	47.5	3.52	44.5	3.43	44.5	3.43	44.5	3.43	44.5	3.43	44.5	3.43	44.5	3.43	44.5	3.43	44.5	3.43	44.5	3.43	44.5	3.43	44.5								
Intestines fat	14.5	1.32	15.5	1.31	15	1.18	19	1.39	14.5	1.07	13	1.07	13	1.07	13	1.07	13	1.07	13	1.07	13	1.07	13	1.07	13	1.07	13	1.07	13	1.07	13	1.07	13							
Livers	20.5	1.86	23.5	1.98	21	1.58	18	1.31	21	1.54	22	1.63	21.5	1.66	17	1.76	14	1.52	13.5	1.52	13.5	1.52	13.5	1.52	13.5	1.52	13.5	1.52	13.5	1.52	13.5	1.52	13.5	1.52	13.5					
Hearts	4.5	.42	5	.42	5.5	.41	5.5	.41	5.5	.41	5.5	.41	5.5	.41	6	.47	4.5	.47	4	.47	4	.47	4	.47	4	.47	4	.47	4	.47	4	.47	4	.47	4					
Lungs and wind- pipes	19	1.73	16.5	1.39	22.5	1.69	21	1.53	19	1.50	16.5	1.22	14.5	1.11	12.5	1.29	14	1.52	7	.82	.82	.82	.82	.82	.82	.82	.82	.82	.82	.82	.82	.82	.82	.82	.82	.82				
Heart fat	1.5	.13	2	.17	1.5	.11	2	.14	1.4	.14	1.5	.11	1.5	.11	1.5	.11	1.5	.11	1.5	.11	1.5	.11	1.5	.11	1.5	.11	1.5	.11	1.5	.11	1.5	.11	1.5	.11	1.5	.11	1.5	.11	1.5	
Pluck fat	3.5	.32	4.5	.38	4.5	.34	4.5	.32	4	.28	4	.28	4	.28	4	.28	4	.28	4	.28	4	.28	4	.28	4	.28	4	.28	4	.28	4	.28	4	.28	4					
Totals	1089	100	1184	100	1328	100	1371	100	1358	100	1350	100	1296	100	966	100	919	100	847	100	847	100	847	100	847	100	847	100	847	100	847	100	847	100	847	100	847	100		

FEEDING LAMBS AT THE WISCONSIN EXPERIMENT STATION.

By the courtesy of the Director of the Wisconsin Experiment Station, Prof. W. A. Henry, we have the opportunity of studying the interesting question, whether or not it is profitable to feed lambs as soon after birth, and while running with the ewes, as may be possible, with a suitable grain ration. From the experience of the author in this line, he has been well able to decide this matter for himself in the affirmative, and very positively so. And it has been his practice to begin feeding the lambs as soon as they could be induced to take the least morsel of suitable grain food from the hand. And right at this point it is very desirable to affirm very positively, that the gentle and confiding disposition of the lambs, and their gentleness and confidence in the feeder, are to be cultivated and encouraged, if the best results from any kind of feeding that may be adopted are to be desired. In fact, the gentle shepherd who carried the lambs in his bosom, is to be the pattern, rather than the one who roughly treats them, and who is feared and avoided by them. In fact we feel decidedly free to say that the gentle shepherd only will be able to make the best profit from the feeding of lambs or sheep of any age. So that to begin feeding with the young lambs, when they will eat a little bran or meat from the shepherd's hand, and troop after him in the liveliest fashion for the sweet morsel, is one of the first requisites to the profitable feeding during the period of nursing on their dams.

The whole story of the feeding is too long for our space, but it will suffice to give the results of each of three carefully conducted experiments. There were three periods during which these trials were made. The first from the first ability to eat the food after birth; the second after weaning; and the third after the lambs were finally fed for fattening for market.

The result of the first test was that thirty lambs were fed 1,353 lbs. of grain food, consisting of corn meal, bran, oil meal (each of these latter two about one-half in amount of the corn meal), and a small quantity of oats too small to notice in any way. The result was that one pound of live weight was made for a very small trifle over one pound of food eaten, or from 1,353 lbs. of food 1,226 lbs. of live weight

was made. After having been weaned this lot of lambs made from 2,276 lbs. of grain food 667 lbs. of live weight, or one pound from three pounds of grain eaten, counting good blue grass pasture in. During the final feeding of these lambs for market, an average of 4 lbs. of grain, 2.75 lbs. of hay and one pound of roots were required to make one pound of live weight. Of course it is to be considered that through the first period the lambs were getting the ewes milk which accounts for the small amount of grain food needed for each pound of live weight, but it was found that the effect of this early growth was to considerably increase the product of growth in the later periods, in proportion to the grain food consumed. There was this advantage as well, which was, that being used to the grain ration the increase of this during the fattening period was not accompanied by any of those drawbacks which commonly happen when lambs unused to eating grain, are put on grain feeding. The lambs continued growth, without any drawback, thus repaid in this way to some extent for the early feeding of the grain. This experiment continued for nine months. At the end of it, it was found that the lambs fed from the first on the grain ration were fit for sale, and had made the same weight, about seven weeks before others not so fed were fit for market. Thus the feeding for these weeks was really saved by the early feeding.

In estimating the results at the final disposal of these lambs, it was found that those that were fed a grain ration from birth not only made seventeen pounds per head for the same age, more than the others, but that they also dressed a slightly higher per cent in weight.

As to the fleeces of these lambs, the results showed that the lot fed from birth yielded an average of one pound more wool per fleece than the other lambs, but this advantage did not obtain after the wool was thoroughly washed, so as to completely remove all yolk and grease, on account of the greater shrinkage in the washing. This of course tends to the advantage of the seller of the wool in the grease. The final test of the butcher's block showed that the early fed lambs were worth about one cent a pound more than the others, and on selling the three lots the first brought \$5.69 per 100 lbs., the second and third lots, \$4.74 per hundred.

The most profit, however, was made from these lambs by selling at weaning, when they made a profit of 68 cents per head over that made from those which did not receive any grain. There is also a profit made by this early feeding when the lambs are sold all together in the Fall, as shown by these figures:

	Lot 1.	Lot 2.	Lot 3.
Value per head.....	\$4.76	\$3.78	\$3.14
Cost per head.....	1.12	.42	...
Profit per head	3.64	3.36	2.14

Thus the lambs having grain food from birth made a profit over those fed only from weaning of 28 cents, and over those fed only while fattening of 52 cents per head; while those fed from weaning made a profit of 23 cents over those fed grain only after weaning and when fed for fattening. It was not found that the previous condition of the lambs fed from birth, had any result good or bad on the final fattening of themselves, over the others, except so far as above suggested that they took to the grain food, as increased for the fattening, without any delay or waste of time.

VALUE OF DIFFERENT GRAINS FOR FATTENING.

Another experiment made to test the difference in the value of farm grown grains for fattening lambs, is recorded in the same report. The intention of these experiments was to show if any difference in cost might exist in the use of the grain foods tested, which were corn, corn and oats, corn and peas, and corn, peas and oats. It is a common belief that a mixed ration may be fed more profitably than any single one of the grains. This is not proved, however, by these results.

THE CONCLUSIONS TO BE DRAWN

From these experiments may be summed up as follows:

First—The highest rate of gain for any period was made when the lambs were fed grain before weaning.

Second—The rate of gain in the second period—that is after weaning—was the lowest of all three periods in the trial, though the cost of the gain was less than in the third or fattening period.

Third—The unlimited supply of grain after weaning caused the lambs to consume less pasture. A half pound of

grain per day per head is the largest allowance consistent with profit at this period.

Fourth—The feeding of oats, bran, or oil meal (linseed is doubtless referred to) mixed with corn meal, as used in these tests, before and after weaning, did not exert any influence upon the rate or cost of gain made during the three months of Winter fattening when the lambs were feeding for the early Spring market (except as we might add, in regard to the earlier maturity mentioned).

Fifth—The continuous grain feeding from birth, until the lambs were ten months old, did not produce any notable difference in the carcasses in regard to the proportions of fat and lean, or the distribution of the fat.

Sixth—The continuous grain feeding produced somewhat better fleshed carcasses, as was shown by the fact that they made somewhat higher per cents of dressed weight as compared with the lambs which received no grain before the period of feeding for fattening.

Seventh—The continuously grain fed lambs from birth, until ten months old, sheared a heavier fleece than those not receiving any grain until fed for final fattening.

Eighth—This increased weight of fleece, however, was due more to the large proportion of yolk and oil, than in the fleeces of those lambs not fed grain, until the third or fattening period.

Ninth—The continuous grain feeding materially influenced the early maturity of the lambs to the extent of seven weeks in three of the trials and four weeks in the other two trials.

Tenth—The results show that it pays to feed grain to lambs before weaning, when they are intended for sale at, or soon after, weaning.

Eleventh—It pays to feed lambs intended to be sold when seven months old in November, with grain both before and after weaning.

Twelfth—When lambs are to be sold at the age of ten months, after two or three months fattening, during the Winter, grain feeding, before feeding for fattening, does not seem to have any sensible effect on the profit made (except so far as maturity is hastened).

Thirteenth—Lambs fed continuously from birth with

grain, are fit for sale at any time; so that advantage may be taken of any favorable condition of the market that might occur.

Fourteenth—The result of five years experimenting in this line, shows that the best time to market lambs is previous to, or at weaning time, and to fit them in the best manner for this disposal as to weight and condition, they should be fed grain from the earliest possible period.

VALUE OF FARM GRAINS FOR FATTENING LAMBS.

An experiment as to the value of farm grown grain crops for fattening lambs was conducted by Mr. J. A. Craig, the Professor of Animal Husbandry at the Station, with the following results. A hundred lambs were purchased from the northwest part of Wisconsin. They were a ragged and poor lot then—lousy, ticky and ornamented with burrs. Thirty-two were not docked. These were docked by tying a string around the tail just above the joint to be severed, and the tail was cut at the selected joint. As soon as the wound had dried, the string was removed, and no trouble occurred. The lambs were dipped to rid them of ticks and lice. It certainly turned out that this treatment was conducive to the profit made in the feeding, otherwise the result would have been different. The first trial was four lots; No 1 fed with corn; No. 2 with corn and oats; No. 3 with corn and peas; and No. 4 with corn, oats, and peas. The results were as follows:

Time Dec. 26 to Feb. 20:

	No. 1.	No. 2.	No. 3.	No. 4.
Weight before trial.....	86.3	89.1	85.6	86.2 lbs.
Weight after trial.....	107.2	110.3	110.8	110.3 "
Gain in 8 weeks.....	20.9	21.4	25.2	24.1 "
Cost of food per head...	\$0.68	\$0.81	\$0.84	\$0.86
Cost of 100 lbs. gain.....	3.26	3.81	3.35	3.57

SECOND TRIAL—25 LAMBS IN EACH LOT.

	No. 1.	No. 2.	No. 3.	No. 4.
Average weight.....	75.7	75.6	75.5	75.3 lbs.
Weight at end of trial...	90.9	89.7	93.7	90.5 "
Gain in 8 weeks, average	15.2	14.1	18.2	15.2 "
Gain per head.....	1.9	1.76	2.27	1.9 "
Cost of food per head...	\$0.66	\$0.72	\$0.83	\$0.80
Cost of 100 lbs. gain.....	4.37	5.15	4.58	5.35

AVERAGE OF TWO TRIALS, 1895-1896.

	No. 1.	No. 2.	No. 3.	No. 4.
Average gain per week...	2.02	1.82	2.41	2.08 lbs.
Cost of 100 lbs. gain.....	\$4.12	\$4.89	\$4.31	\$4.86

The figures show the results very plainly, and as the profit from the feeding is the object for which lambs are

fed, the results need no further remark than that the condition of the lambs is an important element to be considered.

INFLUENCE OF BREEDING ON THE FEEDING.

From what has been said on the subject of breeding, in a previous chapter, it will be easily gathered, that as the feeding is one of the most important elements of improvement of all animals through the perpetuation by breeding of the advantages gained by skillful feeding, feeding really comes first. The improvement of animals by feeding, of course, and necessarily must come first; for if like produces like, the breeding can only perpetuate the elements already existing. The skillful breeder selects the best specimens he is able to secure, and by coupling these he obtains a progeny like the parents, and having the inherited ability to be still further improved by a still further aptitude to feed and digest food, and thus not only fix what has been gained and make it a permanent inheritance, but perpetuate the disposition to feed and turn the food to the best use. The talk of the old breeders, as it is of the modern ones, was always of the feeding ability of their stock, whether it were cattle or sheep. And as we inherit the results of a century of good feeding, we must still maintain in the condition of our stock by the same means as it has been originally gained.

Hence when we discuss the influence of breeding on the feeding quality of lambs we are simply gathering the expected fruits of the inherited ability of the lambs to hold the position which they derived from their parents. And whatever facts are derived from the results of experiments made in this line, we may take as a foregone conclusion that may be applied to encourage the constant improvement of the flocks by higher breeding, for the sake of the profit this insures, when we come to feed these improved sheep.

The experiment here to be described was made by the Wisconsin Station as a sort of final test of the influence of good breeding on profitable feeding. A lot of the station lambs were selected and fed in comparison with a lot of common lambs procured from the northern part of the state. They were of the common stock, bred promiscuously, and

from inferior ewes and rams. The station lambs were Shropshire grades mostly, and having been bred under the care of Professor Craig were, we may be sure, excellent of their kind. Twenty five of the common lambs were fed along with twelve of the station lambs. The following table shows the results of the test.

	Northern Lambs.	Station Lambs.
Average weight at the beginning..	75.5 lbs.	115.9 lbs.
Average weight at end of trial.....	93.7 "	144.7 "
Gain in eight weeks.....	18.2 "	28.8 "
Weekly gain.....	2.27 "	3.60 "
Food eaten—		
Corn fodder	102.7 "	135. "
Corn	48.8 "	71. "
Peas	48.8 "	71. "
Cost of feed.....	\$0.83	\$1.17
Cost of 100 lbs. gain.....	4.58	4.08

Each of the station lambs gained 1.3 lbs. more than the other lambs per week, and while they consumed more food, the excess of food is not as large in proportion as the gain made. This ability to eat and profitably dispose of good food, is one of the most prominent features of better breeding, indeed it is the very fundamental principle involved in breeding, and thus, it goes without saying, that the better bred the stock is the better feeding it demands, and in return for this just compliance with the demands of the improved sheep, these make a generous return with sufficient profit to compensate the feeder for his just compliance with the demands of his flock. This is never to be forgotten by those concerned, who are anxious to get all the profit that may be from their improved stock.

An instance that may be pertinent, and that tells the story in an emphatic manner, may be given. There was a noted breeder of Jersey cows, who sold a high bred calf to a farmer at a distance. This man was one of those who, very mistakenly, think high breeding will give the ability to an animal to live on less food than a common scrub, as it is called; and that the high price paid for an animal of this kind will be returned in the cheaper feeding of it. The calf under this kind of management soon became an object for the pity of any humane person, and of reproach to its owner. The owner became exceedingly wroth against the breeder of the calf, and as an example had the poor animal put on exhibition at a popular state fair, and on his card mentioned the name of the breeder of whom the calf had been bought.

This second foolish act of the man of course told severely against him in the minds of well-informed visitors, but it procured him sympathy from those who were not better informed than himself. The calf was purchased for a small price, and under the right treatment, became a noted cow whose progeny sold for the highest prices current for Jersey stock.

Of course the same applies to sheep as to other animals, and purchasers of high bred breeding stock, whether ewes or rams, should take this essential fact into consideration, and make it a rule of management to treat the animals with every possible liberality, of course, in a judicious way, and keep in mind this fundamental principle, that breeding, being a natural result of the precise condition of the animals bred, the progeny must have the same liberal treatment, and we may be sure it will be as liberally returned with interest, as it is liberally afforded.

The result of the foregoing experiment in feeding the lambs may be given as follows.

Difference of profit between the two lots:

	25 Northern Lambs.	12 Station Lambs.
Cost, at 3 cents a pound.....	\$56.68	\$41.73
Final value.....	93.70	69.50
Cost of food	20.75	14.14
Profit per head.....	0.65	1.13

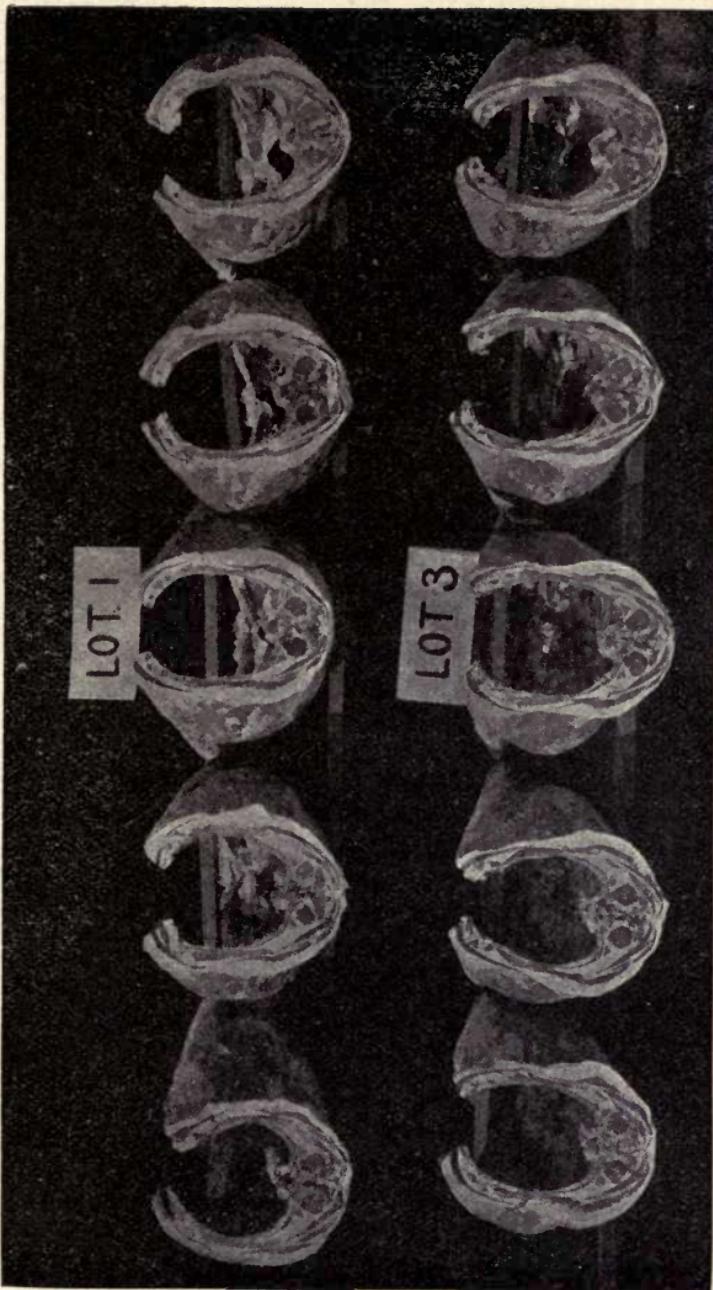
CONDITION, AND ITS EFFECT ON VALUE.

The professional seller of live stock has certain elements of value to guide him in the pursuit of his business. One of these, if not the principal one, is what is termed condition, or sometimes quality. It is this special characteristic of the animal which gives final value to the meat to the consumer, who of course chooses the meat which has the least waste, and is of the most promising appearance for economical domestic use. This quality necessarily has its special value, and where sheep or lambs are offered for sale, as indeed cattle as well, the buyer will take pains to ascertain the condition of the animals he is proposing to buy. Necessarily the producer must be well informed of the nature of this condition, so that he may send only those best fitted for market, if he thinks of getting the top price. There are numerous instances in which the commission man will tell his client, you should have kept these lambs or wethers a

month or two more, to get them into better condition. This suggestion means to the owner a loss of money on his consignment, perhaps a dollar a hundred pounds, which might have been saved by two or three weeks longer feeding, by which not only the value would have been increased in proportion to the condition, but as to the increased weight as well. It is to get this condition that many farmers buy stock in the markets that are as yet only feeders, and not finished for the butcher, and get such animals at such a less price, that it pays the purchasers to take them home and feed them, adding to the weight by which a good profit is made, and getting as a bonus the enhanced value due to the improved condition.

The first test of condition is smoothness of the carcass. The bones are well covered, and the body is round and well filled up. Some animals are better shaped for this than others, and these the professional feeder calls "good feeders." That is, their bones are not so prominent, the backbone does not form a ridge along the back, the sides are deep, the ribs are well arched, the neck is short, the head fine, and small, and the legs well spread apart. You cannot build a broad house on a narrow foundation, and an animal must have the right shape before it may be profitably put into really good condition. The figure will in no part be regular or thin, but round and full, with soft flesh which covers the bones, and to which the skin is loosely attached. The outside is a key to the condition of the inside, and we are to judge by the outer form and feeling, what the actual condition will be when the carcass is exposed to view in the butcher's stall. It is a good plan for those concerned in feeding sheep for market, to visit a great city and stroll through the markets there, and talk with the market men. Many valuable hints may thus be procured which will be useful in the rearing of market animals.

Generally it is the larger animals which are defective in condition. Size is of no account unless the condition is satisfactory. A lamb may match the size most desired, but it is not weight alone which gives value. Another may be ten or twenty pounds over the average weight desired, and yet may bring a better price for the reason that its condition is better than that of a smaller animal. It is to be thought



Photograph of the carcasses of the lambs in Lots I and III in the second trial of the experiment in grain feeding lambs for market. The carcasses were cut at the fifth rib so as to show the mixture of fat and lean in the flesh. The uniformity of the carcasses in this respect represents the results obtained in the other trials.

of that the end of all is the meat, and the quality of it. This is the only useful part to the consumer. The more meat there is in a twenty pound quarter, and the less bone, the better the animal is; for whatever less of actual meat there may be, the more there is in proportion of bone and worthless stuff. And to secure this desired condition too it is better to feed a longer time, than to rush the feeding through by too liberal rations. The fat made now is not wanted in the meat, and not laid all on it on the outside of the carcass. The actual appearance of the carcasses, as shown by the photograph on the previous page, of the first and third lots of lambs, the first being fed grain from birth, and the third only three months before marketing, goes to show the inside appearance of what good condition is, and how it secures that economy in the final use of the meat, which justifies the butcher in giving a higher price for the best carcasses, as well as in exacting a higher price from the house-keeper who is quite willing to pay it as a simple matter of domestic economy. The feeder will work with more light and better success, who understands fully what this term, condition, signifies.

In the previous illustration we may readily select the best conditioned lamb by the rounder back; the more even distribution of the fat with the lean, and the larger volume of the lean as it is surrounded by the loin fat. This is the result of the smooth, broader back taken as one of the tests of condition of the sheep. We may readily perceive that this is one of the results of breeding as well as of feeding, and is as much due to the rams used as to the good feeding of the ewes while carrying their lambs, and the skillful feeding of the lambs.

CHAPTER V.

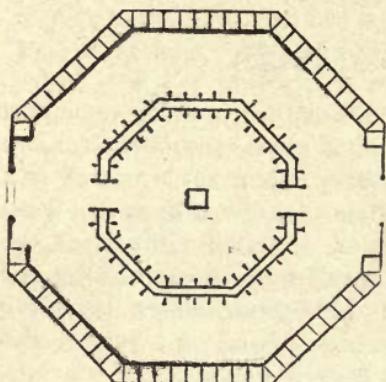
BARNs AND STABLES.

The best arrangement of buildings for a sheep farm is a matter of economy, for whatever is most convenient for use saves time and avoids waste of feed. A great waste of fodder may occur unless the feed racks are made on the best plan to prevent it, and with a mere trough for the grain the strongest sheep will push its way along, monopolizing the most of it, and driving the rest of the flock before it deprive them of a due share. This is a waste, and an injury to the greedier feeder, while the weaklings of the flock are starved. The structure of the whole building too is to be well studied out, so that it may be arranged on the most useful system.

A few remarks on the general theory of sheep shelters may be useful at the outset. There is no necessity for heavy, costly barns or stables. Light structures with ample floor space are the best in every way. And we are not studying style at present, but simply the ways in which the shepherd may use the money to the best advantage, and with the utmost economy of time and labor in the general care and attention given to the flock.

The most space is contained in a square building, at least as compared with longer and narrower ones. There is most space for the length of outer wall in a round building; and the octagon and hexagon, with their eight or six sides, come next to the full square. The octagonal style of building is coming into favor for farm structures, and many are adopting the round form for all kinds of storage barns and the accommodation of the live stock. The accompanying sketch is of an octagonal building 29 feet in diameter, of which the floor space gives 696 square feet. A square building with the wall 96 feet in length will give only 576 square feet of space, and will be twenty-four feet only in diameter. A round barn of the same length of wall will give 732 feet

of floor. It is easier, however, to build an octagonal barn than a round one, for the timbers are much more easily put together, and the structure is much stronger; each corner binding the whole in an equally solid manner; in truth, more so, than in the round one or the square. The plan here given is one of 96 feet of wall, that is, twelve feet on



OCTAGONAL BARN.

each side, by which there is room for nine places for feeding on each side, thus giving accommodation for a large flock if several feeding racks are scattered about between the middle rack and the outer ones. It is well adapted to lamb rearing, on account of the number of small pens which may be made large enough for a ewe and its lamb or for two or three lambs, the middle space being used for

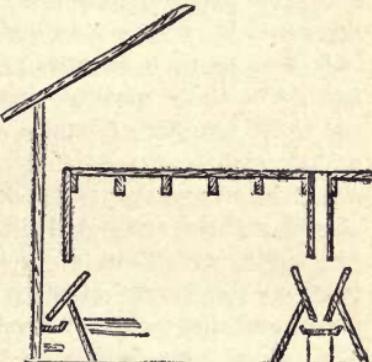
feeding the lambs by turning them out when the ewes are brought in to suckle them. A barn built on this plan may have two floors, by which the capacity is doubled at a very small increased cost, the main floor being three feet below the surface and the upper one four feet above, and being reached by a plank walk at each door. It is to be noted that the capacity of such a barn as this is increased four times by doubling the diameter, and one-half increase in this, that is, from twenty-nine or thirty feet to forty-five, will make it two and a half times as capacious.

The method of building such a barn is much cheaper than that of the square or oblong form. The floor should be of cement concrete, and it is best to have the foundation for the sills of the same material, but it need not be over six inches thick, merely to raise the timbers from the ground. The sills may not be over four inches thick, and eight wide is sufficient. The corners are merely halved together and bolted with a one-inch iron bolt. The scantling for the walls for the two floors should be six by two inches, and a row of these is placed in the middle of the building and rest on posts six inches square. There is a central shoot

in the middle made of two inch plank for taking down the fodder, and the inner row of beams rest on this; the beams being for the size of building mentioned, eight inches wide and two thick. It is well to support these beams in a sufficient number of places by braces at each alternate post.

The plates are eight by two or three inches, halved together as the floor sills are, and secured by bolts held by screw ends and nuts. The upper part has the usual purline plates over the rows of posts below, and these are well bolted together. The rafters are in two parts, the lower set having a high slope so as to afford as much storage space as possible above. There is a hay shoot in the center, down which the fodder is sent from the hay floor on the top, and shoots are made in convenient places to send down the grain, which is distributed through the feed troughs below by means of spouts made of common bagging cloth, placed at convenient distances, by which the grain from the bins above is shot down into the feed troughs on either floor, being guided by an assistant below who leads the spout from place to place as he may desire.

This kind of barn has been found very convenient and cheap to build, two men having fully completed one of the size mentioned in a week, the roof being quickly and well made by the use of the metallic roofing plates, simply nailed to the rafters without any sheeting under it, unless this is desired. But as the roof is quite steep it may be made of the plain weather boarding, lapped two inches and painted. The top should be covered for two feet or so by a cap of sheet zinc or galvanized iron. The cut shows the arrangement of the hay spouts and the feed racks.



FEED RACKS AND SPOUTS.

Figure 2 is that of a cheap frame building of light materials put together in the strongest manner by means of the bracing shown. It has a clear floor above, and it may be made of three stories, two floors being occupied by sheep,

and the top floor by fodder. It will make a most desirable house for rearing lambs, as there may be six rows of pens on the main floor, double planked, if two floors are used, in the upper part, to keep the lower one dry. Or the upper floor may be occupied by the lambs and the lower one by the ewes. The braces bolted to the other parts of the frame give great stiffness as well as a clear space at very little cost of labor in the building. A barn on this plan, 180 feet

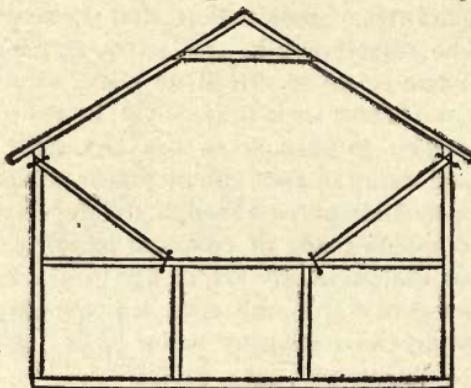


FIG. 2.—CHEAPLY BUILT SHEEP BARN.

by 40 has been found to cost less than half that of a square barn with the same floor room, which is 7,200 square feet, a little less than one-sixth of an acre, or a third if two floors are used. It will accommodate 700 sheep, giving one and a half feet of rack length to each sheep, which is ample; or if for lambs there may be room made for 400 ewes, as well as the same number of lambs, which will be kept in pens in the middle space.

It has been contended by some sheep breeders that enclosed stables are not desirable, and that mere open sheds are sufficient. This is opposed to scientific rules, which go to prove most emphatically, that exposure of any animal to cold causes a waste of food which is required to maintain the animal heat indispensable for health and comfort, both of which terms are equivalent; for discomfort, as we know in our own experience, is merely a condition which leads to disease, and a diseased sheep will first show its condition by the dropping of the wool or a serious loss of flesh. So that the belief of every well informed shepherd is that sheep need good comfortable shelter, as well as other animals do.

There is no necessity for expensive buildings, all that is required is shelter from the snow and rains of the Winter. This is so important that the Scotch, and some of the English, shepherds take every precaution to protect the sheep by the use of oiled jackets to shed the rain from the sheep's back, which is the most vulnerable part of the body, as the spinal nerve which runs along this part of the body may be easily chilled, and this causes such serious disorders of this nervous center of the body, as to produce the most fatal diseases. It will be useful to refer to the chapter on diseases, in which this most sensitive part of the sheep's anatomy is fully described, and the effects of injury to this great nervous center are particularly discussed. Besides this precaution, these shepherds grease the fleece so that it will shed the rain and prevent it from penetrating to the skin, and thus by the severe chilling effects cause these spinal diseases. These precautions are needed when sheep are fed out in the fields, gathering for themselves the common root crops on which the chief Winter feeding of the flocks consist, and especially in a climate where rain is so almost constantly drizzling as in England and Scotland.

There are serious difficulties in the way of our adoption of this method of feeding our flocks, and thus we are obliged to provide ample protection by means of sheds, or completely finished barns or enclosed stables. The mere shelter is all that is needed, but provided in such a way that the necessary conditions for health are secured.

An excellent shed suitable for sheep may be built for the small cost of fifty cents a foot in length, and length is more important than width, for a wide building must have stiff and heavy timber in the frame, while one of twenty feet in width may be made wholly of the lightest framing stuff. Indeed there need be no framing about it; the stuff is put together with nails only, and with a double row of studding in the center, where the feed racks are placed, will serve to hold up the fodder stored above. The author has built a substantial shed twenty feet wide and a hundred feet long for fifty cents a running foot; and with extra fittings and everything done in the best manner, the cost has been under a dollar a foot for a well furnished lamb house, separate pens and feed arrangements all included.

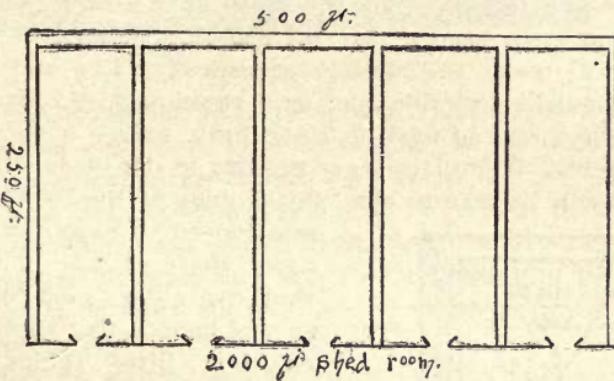
Twenty feet is quite sufficient width for any sheep house. This permits four feed racks, a double one in the center, and one at each side, or a row of lamb pens on one side if desired. If the ground is dry, and not in a hollow, so that the rain flows off from the eaves on each side into gutters provided to carry off the water, no floor will be needed. The whole front may be made of sliding doors hung on rollers, the doors being pushed open in fine weather, and closed in storms. The upper half of each door is provided with shutters that may be opened when needed or closed for full protection. These shutters are hinged so that they may be turned down, and bars are placed inside, as a protection for the sheep in such localities as where prowling dogs are too numerous or wild animals may attack the flock at night.

For range flocks shelters may be made very cheaply. The author, when keeping a flock in Western Kansas, built a range of sheds in this manner. The outer wall was of sods laid up in the manner of a sod house, then a common method of construction on the open range and distant from the railroad, and especially when the capital in hand could be much more profitably employed in buying and feeding sheep, than in costly buildings. The main building was a shed five hundred feet long, the outer wall made of sods cut with a sharp steel plow, and chopped with a broad-ax into lengths of six feet. The sods were eighteen inches wide and four inches thick. They were laid up into a wall six feet high. The front of the shed was of posts eight feet above the ground level, of cottonwood cut on the banks of the river which ran through the range. The plates in front and the rafters were of the same kind of timber, and the roof was of thatch made of the abundant grass and sedge in the wet bottom lands, which supplied very good hay when cut in good time.

Six similar sheds were made from this main one, half the length. These were double, having a row of posts in the center and one at each side. The roofs were all of thatch as the main shed roof was. The outside sheds had the outer walls of sods, and the shepherd's house was wholly of sods, with a thatched roof. This thatch is made of bunches of grass laid first on the eaves, and tied down to split laths tied to the rafters, with tarred twine sufficiently strong for

the purpose. As a row of the thatch was laid another was laid on it, and fastened down with the twine. As each row of thatch was laid it was beaten down with a light mallet to flatten it. The top of the roof was tied in a similar way by winding the twine in and through the grass so as to secure it firmly. The roof so made was perfectly watertight, and after being clipped with shears made a smooth, neat appearance.

The front was made of wire fence seven feet high, and the strands three inches apart for four feet up, and seven inches for the rest. Sufficient gates, made of split stakes, were put in the front. There were five separate yards, each eighty feet wide, and the Winter stock of fodder was stacked in these yards to which the sheep had free ac-

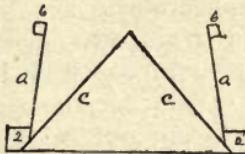


PLAN OF SHEEP SHEDS.

cess. Corn was fed on the ground, and this without any waste; the sheep eating it clean from the ground; and each getting its due share better than when fed in troughs. The whole enclosure was about three acres. The sheep fed out on the range most of the time, and were brought into the shelter only when storms threatened. A barometer, of the kind known as aneroid (a perfect portable instrument) was daily consulted and at every considerable fall the flocks were brought up. This is a good practice to follow on the range, as in every instance the prediction of the barometer was verified, and many sheep were saved that would surely have been lost without these warnings. A plan of the sheds is given, the gates are seen to open inwards, a convenient precaution for safety.

A few years' experience showed that the use of fodder racks for feeding under similar circumstances, is not profitable. The racks cost something, especially where lumber is worth a high price, and generally is not to be obtained. The loss of hay, costing something less than a dollar a ton stacked in the yards, and the entire absence of waste in feeding corn on the ground, by exercising a little care in scatter-

a, Slats $2 \times 1\frac{1}{4}$ inches, sloping in, nailed to scantlings 2×2 at top. *c*, Sliding boards. *2, 2*, Grain troughs 8 inches wide. Bars are nailed across the grain rack of every third slat to prevent sheep from crowding.



DOUBLE HAY RACKS AND TROUGHES.

ing it from a wagon before the sheep have been let out and have scattered, render this method of feeding the most economical under the circumstances. If a hay and grain rack is thought desirable this one is recommended.

Another form of feed rack and grain trough is shown in figure below. When lambs are running in the sheds with the ewes it will be safe to close in the ends of the feed racks,

and indeed to carefully close every space or hole in which they can enter, as it will be sure to happen that these mischievous little things will crawl in somewhere and get fast and only be discovered when too late, and they are lost.

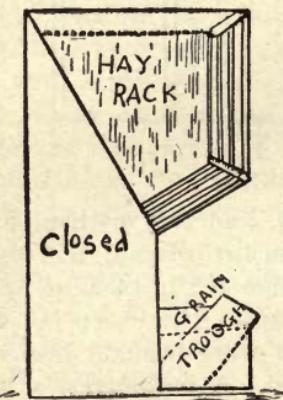
SOILING SHEEP.

On farms where the pasture is not sufficient, and green crops for feeding may be grown at a small cost, feeding these in yards in which there is convenient shed for shelter at night or in stormy weather in the Winter, will be found a cheap and very desirable practice.

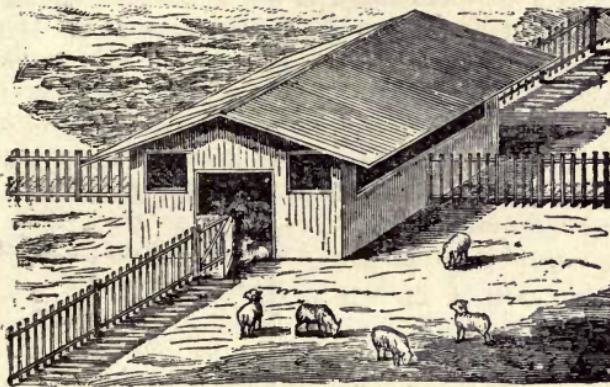
HAY RACK AND GRAIN BOX.

Grain box has cross cleats to keep feed in place for each sheep.

A barn or shed placed in a central part of the space to be allotted for this use will be required. A plan of such



a shed is here given. It is designed for a flock of sixty or seventy, with room for the lambs included. It is made with a low roof projecting well over the walls, so as to afford pro-



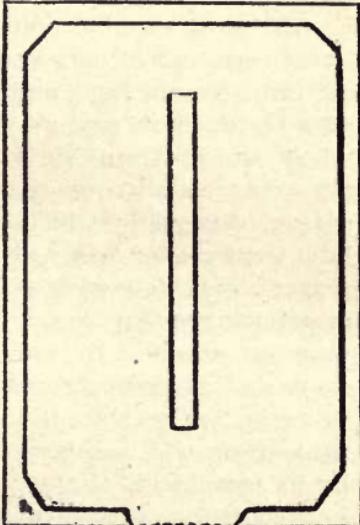
SHED FOR SOILING SHEEP,

tection from sweeping rains or snows. The window places are open but protected by wire netting as a precaution against dogs, where this danger may exist.

The floor plan is shown at figure. The feed racks run around three sides and partly in the front, with one in the center giving the usual rack space of a foot and a half for each of about seventy sheep.

The upper part of the front door slides on rollers, and is made of slate so as to give ample ventilation along with the large open window spaces.

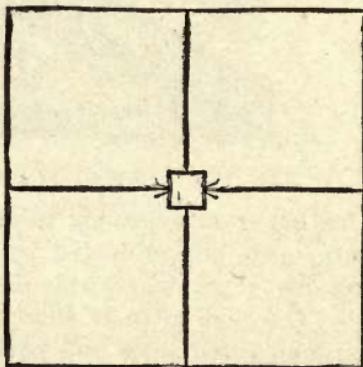
The lot appropriated for the sheep is fenced into convenient plots, into each of which the lower gate opens so that the flock may be turned out to feed on the remains of the crops after the cutting has been completed. Indeed it is a part of this system that the sheep may be fed out of doors, in any of the separate plots by cutting the crop in an adjoin-



FLOOR PLAN OF SHED.

ing lot, and giving it in suitable racks. A large quantity of dry fodder may be saved in this way for Winter use, for as fast as one plot is fed off, the land is immediately sown or planted with another; and it is this succession which makes this method of feeding so cheap and profitable. It is used in dairies for feeding cows, and under this system one square rod of ground feeds a cow one day, thus making one acre and one crop feed 160 days. This is equivalent to seven sheep. By good management, as by having crops come in succession, two and even three may be grown on the same land in the Summer.

The chief crop is sweet corn, the earliest of which planted in this way, three times as thickly as for a grain crop, may mature in sixty days. This may be followed as soon as cut by another planting. Indeed, the cutting and planting go on simultaneously, for as fast as a strip of ground is cleared, the plow is put in and this land planted or sown at once.



PLAN OF SHEEP-YARD.

The most suitable crops for this system of feeding are sweet corn, mixed oats and peas. Sorghum (which may be cut three times), rape, and one plot of orchard grass, which affords constant pasture if well distributed through the whole season, from April until the snow flies. Turnips or rape may be sown on the last corn, to add to the feeding season. Suggestions in this way only need to be given, the intelligent reader will suit himself according to his circumstances, only following the general plan of always having something growing, and no land idle a single day during the growing season. In this way every farmer may find it easy, and exceedingly profitable, to feed a flock that may bring in five or six dollars a head every year, and at the same time add considerably to the products of the land by its enrichment through the manure made. This is most important for every farmer to consider.

HANDLING SHEEP.

The handling of sheep is a science to be studied. You cannot drive them without some method of controlling them. Where one leads all will follow. There is an old, but doubtless true, story told of a flock going to market, and there came in the way a small huckster's cart loaded with truck. There was ample room for the sheep to pass, but one sprightly ram took a notion to jump over the cart, which he did in the best style; every other sheep followed the lead, and made a flying leap over the cart, and the bewildered driver of it. Sheep have this way of "following my leader" just as the boys do in their games, and it must be prepared for by some reason of controlling them and forcing them to go in the way they should. The stock yards afford a lesson to the shepherd, for on some of the large ranches there are equally easy means of handling sheep in a large flock. Mr. J. E. Wing of Ohio gives us a story of the management of sheep at one of the stock yards in Chicago, and his pleasantly told tale interests all concerned, shippers of flocks for sale, and especially buyers for feeding.

SEEN AT THE CHICAGO STOCK YARDS.

The stock yards is an admirable place to study the American sheep industry. I could spend weeks in the sheep sheds with pleasure and profit. Let's look through together.

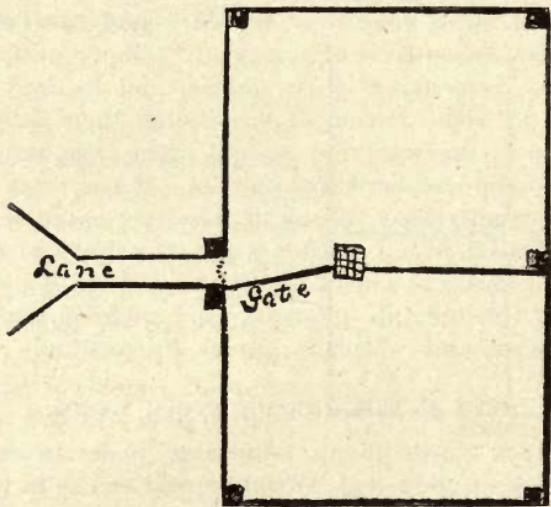
Here is a load—some 250 head of Montana wethers. They are great tall, big-framed, lusty fellows, mostly smooth-headed, but a few have horns. They are fat and the killers want them. The buyers look them over and bid 4 $\frac{1}{4}$. That means about \$5 each for the lot, and a happy rancher somewhere on the slopes of the Rockies.

Here is a lot in thinner flesh that will go out to the country to be fed. They will cost about \$3.60, or better, and as they are good shearers, will no doubt be money makers this year of cheap feed. The evenness of size and appearance of these westerners is much in their favor. This is mainly the result of correct breeding, but proper sorting has done a good deal toward it.

Here we see a bunch of newly arrived sheep being "put through the mill." The man with the sharp eye and trained

judgment, stands and shifts the gate, shunting the ewes and thin sheep into one pen, the prime muttons into another. This sorting pen is so useful a thing that I think best to show a sketch of it here. Most sheep farmers need one.

The lane must be narrow enough to compel single file, as the sheep go in, sixteen inches is about right, and the lane should be ten feet long at the least, twenty feet is better, and the gate closed or opened switches the approaching sheep into either apartment as desired.



SORTING PEN.

This pen of western lambs interests us. They have the tell-tale smutty faces indicating the Shrop cross. We would like them to feed, so healthy and lively and growthy they seem, but Swift's buyer bids above the nickle and we leave them to him.

Here is a small lot of native lambs. They seem nearly full-blooded Shrops. Note the shrunken fleece, lack-lustre eyes and languid movements. These mean that parasites have struck them. Everywhere I go the evidence piles up before me that the parasite has the eastern shipman in his grip. What are we going to do about it? We will do something, depend upon it.

Here are some native ewes, good ones, nearly pure-blooded Shrops. They, too, are infested, as is plain to be

seen. A farmer has bought them to take back to the country. I pity him his experience of the next year or two.

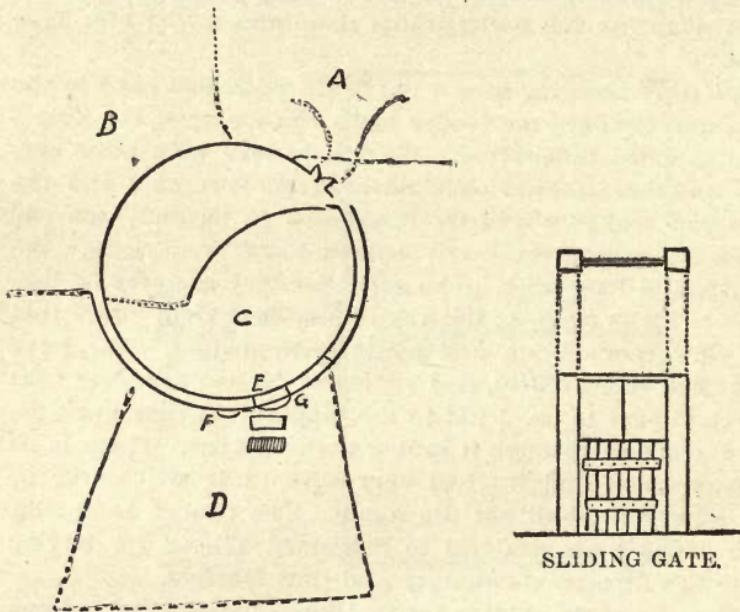
Here is another pen of natives, and what queer sheep they are! Long in the leg, thin in the fleece, thin in the chest, with pendulous bellies, like Indian famine sufferers; it is a mystery to us that such sheep should exist in America and good rams so cheap. There is a vast difference in the quality of the westerns. Some one-half Cotswolds from Utah tempt us, but Swift wants them and we let him have them.

Monday morning sees a big "run" of 25,000 head in the pens, and for once the feeder has a chance after the killers have supplied themselves. We fall in love with some one-half and three-quarter blood Shrops from Wyoming and the salesman makes a quarter concession to us and soon 600 lambs are rolling toward Woodland Farm feed yards. We have paid a long price, to be sure, but they are only 56 lbs., and are all so even, so healthy and so free from "tail" that we view them again and again with delight. We have never had such feeders, and visions of fat 100 pounders next March appear to us. First to the dipping vat they must go, and the 600 go through it in less than an hour. There is no scab on them and we feel very sure there will never be any now, and shall not dip again. The charge is but 3c. each and we are grateful to Secretary Wilson for having made this dipping compulsory and thus feasible.

Homeward we rumble across Illinois prairies and Indiana fields, burned to a crisp by the long drouth, the yellow corn standing in great fields on either hand. Riding much on the car roofs we study the farms on either side. Few sheep are seen; none that would indicate even an attempt at systematic sheep husbandry. We think long of the future—and what it has in store for us. Are we to learn how to keep sheep in this central country, or are we to continue to lease it to the western brothers? Is it a safe business to buy feeders in Chicago and compete with killers to run prices up—up?

A method followed on one of the large Texan Ranches is here shown. A and B are two large lots into which the sheep are gathered for dipping, marking or sorting. A round, central pen (C) into which the sheep may be driven from either

of the others, by means of the three-fold gate at the end of the circular driveway, or alley. The sheep are gathered in the lot B, and driven round inside of the curved fence to the dipping vat, and the dripping vats at F and G. The circular fence is two hundred feet in diameter and will hold two thousand sheep. It is easy to handle the sheep in any way, by the gates in the alley, which is three and a half feet wide. The alley is closed in the places marked, by a sliding



A TEXAS CATCH PEN FOR SORTING
AND DIPPING.

gate, shown at small figure, and will hold 200 head or more. By dropping the sliding gates this lot may be divided into four lots, each of which may be handled with ease for any purpose desired, marking, dipping, sorting, or examining. By using hurdles the part of the circular pen below the curved fence may be closed in and the gate at either entrance may be closed at will. As soon as one pen is emptied it is filled again from the next one, by lifting the gate by a cord running over a pulley, and as fast as one lot is done with, the next comes to hand without trouble or delay. The rear pen D is used for drying the sheep after dipping them in the vats and passing them through to draining floor

F and G. The shearing floor and the shepherd's house are in this pen D, near the dipping vat.

A MANITOBA SHEEP HOUSE.

A Manitoba farmer has solved the problem of how to dispose of the refuse of his large wheat and oat crop, and preserve the fertility of his land with profit. He, as other wise farmers have been doing for ages past and are doing to-day, keeps sheep to consume the wastes of his grain crops; the straw and chaff, and the screenings of the wheat cleaned for sale together with ample crops of oats and peas grown together, and harvested when the grain is merely formed, and then ensiloed. This feed is well adapted to feeding sheep and no other is required either for maintenance of the flocks or for fattening those drafted out for sale.

He has also solved the problem of the housing of the sheep, when this is necessary or even desirable for the welfare of the flocks. His houses are constructed in the simplest manner. They are 200 feet long and 50 wide, having a feed trough on the rear side, and cross feeding racks by which the house is divided into pens 25x20 feet. A passage runs the whole length of the house, and is eight feet wide. The entrance gates to this passage are made to open outwards, but only half way, so that they form an entrance with sloping sides by which the sheep entering cannot choke the way or injure themselves by crowding in the sharp entrance. The passage way is provided with gates which are hung by cords which go over pulleys on the center posts; and weights being attached to the cords so as to partly balance the gates, they are lifted with ease by a mere touch



FIG. 3.—FRONT OF THE HOUSE.

For a Grain Farm, Oat and Pea Silage, with grain for feed.

of the hand, and remain suspended until drawn down again.

By this device each department of the house may be closed and each space of fifty by twenty-five feet turned into a separate pen, having a door to the outside where a

large yard is enclosed by hurdles, which may be moved with ease, or one of which being loosened forms a rotary gate. There is room for a thousand sheep in this house, without crowding at the feed racks. Fig. 3 shows the front

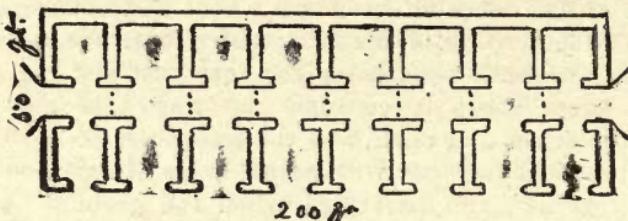


FIG. 4.—FLOOR PLAN WITH FEED RACK.

of the house; fig. 4 is the floor plan; and fig. 5 shows the section through the house with the framing and the passage way, with the feed racks on each side.

This passage is wide enough to permit a wagon or sled to go through with a load of fodder, which is distributed easily among the feed racks with the least amount of labor.

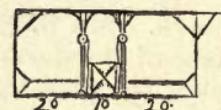


FIG. 5.—SLIDING GATE.

This house is built of posts set in the ground. The framing is all of rough timber, and the roof and whole enclosure consists of the common steel sheet roofing. It is furnished with tight gates, so that in the heaviest cold storms it may be entirely closed in, ample ventilation being provided for by the long narrow openings in the front of each gable, and others at the back. The feed troughs are made of the steel sheeting, nailed to common post timber, hewed into the proper form. This resource was made necessary by the difficulty of getting sawed timber, and the hewing was cheaper than the sawing with whip saws.

The fundamental rules for success in housing and handling sheep may be repeated here for full consideration; so that each one concerned, knowing his own necessities and conditions, may apply these suggestions to his own individual case. It was once remarked by one of the most profound and successful teachers of mathematics as a rule for his pupils (of whom the author was one) that whenever there was any doubt, one should immediately revert to the principle involved in the question. Everything in the whole

conduct of human affairs has its dilemmas, and times, in which this going back to the principles involved is the secret of success. So that we may suggest these rules for general guidance when one is in doubt of what is best to be done in any circumstances. Then any man, with a little thought, may adapt his conduct to the conditions by which he is confronted.

Rule 1.—Sheep require to be led, rather than driven. They are to be controlled by such means that they cannot help but follow in the way they should go.

Rule 2.—Although naturally hardy they are the weakest of animals when misfortune overtakes them, and their natural stupidity, or—as might doubtless be more correctly said—their inborn disposition to depend on their masters, renders them an easy prey to any unfavorable conditions. This is the inevitable result of their domestication from the earliest ages.

Rule 3.—Sheep are fretful under disappointment. No other animal is so much disturbed or suffers by irregularity of management. Hence in all their management, in feeding especially, the utmost regularity is to be observed.

Rule 4.—Although it might be thought that their woolly coat is a sure protection against cold, it is only so in regard to dry cold. Exposure to wet, by which the fleece is saturated, chills them severely; and this on the most susceptible part, the spine. Hence the flock is to be protected in accordance.

Rule 5.—Sheep are as easily chilled inside as outside. Hence the water supplied to them should be pure, and never so cold as to chill the stomach.

Rule 6.—The sheep's fleece is of such a nature that exposure to wet and warmth, or pressure, causes it to felt. Hence a wet fleece is to be avoided, or, if it must be so, the sheep must not be crowded together.

Rule 7.—A sheep is subject to a greater number of parasites than any other animal and suffers more than others from them. This calls for suitable precautions to avoid this exposure.

Rule 8.—The inborn dependence of sheep upon mankind calls for the constant thought of the shepherd to study the necessities of the flock and to provide in advance for them.

Rule 9.—This last rule is to be understood to apply not only to number, but to every other condition of the flock. "Whenever the shepherd sees his sheep let him count them." This includes a close examination of the condition as well as to the numbers.

MR. J. E. WING'S BARN.

Economy is always in order, and a cheap and commodious barn for a small breeding flock, designed by Mr. Wing is here described and illustrated. It is a noteworthy commendation of this design that it has been adopted by the Ohio Experiment Station.

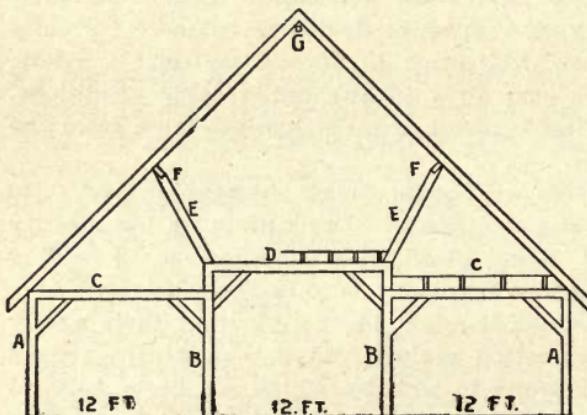


Fig. 6. Fig. 7.



The posts, AA, are 8 feet tall, and in my barn will very probably be round white oak posts, set in the ground. They will not rot off in my time, and when they do my boy can saw them off and set them on stones.

The posts, BB, are ten feet high above ground. This difference in height is made to allow a driveway through the building. This is not necessary in all cases, and it may be that J. R. D. will prefer to take in his hay at the end of the barn, and have his mow floor level, in which case the posts will all be of the same height.

The plates, CC D, are of joist, 2x8, and are double, that is, one is notched in on each side of the post as shown at Fig. 6. These notches are cut just deep enough to leave 4 inches of wood and of space between the joists; the braces then pass up between the double plates and are firmly spiked to them. At the foot of the braces the post

is flattened and slightly notched, and the braces spiked there. The plates on which rest the rafters are made of two pieces of 2x8, spiked on as shown at fig. 7. This makes a very strong and stiff plate, and is really better than the old fashioned mortised plate and many times easier put on.

The rafters are in two pieces, splicing in the center, a lap-splice spiking together. They are supported in the center by a purlin plate, F, which is 3x10, and supported by the purlin posts, E E. In putting this up temporary braces will be used until the rafters are spiked in place, when no further bracing is needed. This purlin does not receive the thrust of the rafters but merely supports the weight, the thrust being held at the plate below.

At G there should be a track for a hay carrier. I prefer the wooden tracks of 4x4 and the sling carriers. The mow will hold about 12 tons of hay. The floor is supported by 2x8 joists spaced 2 feet apart over the center and 3 feet over the side bents.

For roofing I shall use the best shingles that I can get. We have now a good deal of iron roofing and it is not satisfactory. It requires paint too often.

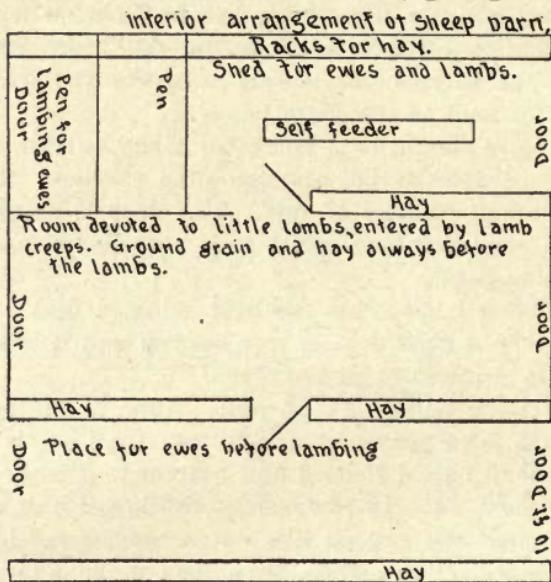
Siding may be of oak or pine. Pine is better, unless the oak has been seasoned without warping or twisting; it should be well nailed if used and battened. Plenty of doors should be used, each in two halves, the lower half swinging and the upper half raising like an awning, hung by hinges at upper edge. Thus the sheep may have sun and air, and yet be kept in by the closed lower door.

Here is a bill of lumber and approximate cost of same. I charge but \$5 per thousand for the oak, as that is all it will cost in cash to one having the timber;

8 posts, 8x8 (or round), 10 feet	427 ft.
8 posts, 8x8 (or round), 12 feet	512 ft.
8 posts, 4x8, 8 feet (purlin)	192 ft.
69 joists, 2x8, 12 feet	1,104 ft.
6 purlin plates, 3x10, 12 feet	180 ft.
34 4x4 girts, 12 feet	544 ft.
1,120 1x4 sheeting	1,120 ft.
1,276 feet flooring	1,276 ft.
76 rafters, 2x5x16	1,013 ft.
 Total oak	 6,368 ft.
Cost of 6,368 feet oak at \$5 per M.	\$31.84
1,800 feet pine siding	36.00
18,000 shingles	46.80
Nails	5.00
Labor, help about raising, etc.	15.00
 Total cash outlay needed	 \$134.64

hatchet" carpenter. It is really nothing but a strong hay scaffold covered by a roof. Yet, if well braced as shown, it will be amply strong and will last as long as any kind of frame, and it can be built by any man able to own a hundred sheep. There is no doubt that it pays to shelter all sheep from storms east of the Missouri River, and one cannot afford to own sheep that he cannot shelter.

As to the arrangement of the interior, I mean to devote the central division to the little lambs, giving them access



to it through a creep. Lambs are timid things, and will not thrive when obliged to struggle for their rations with older sheep. They also need a clean, dry place in which to romp and play and lie and sleep. The only profitable lamb is the happy one.

One side is devoted to the ewes that have not yet lambed, requiring different food and care from those suckling their lambs, the other to the mothers. It will be well if possible to give each flock access to a dry grass-lot for exercise. If but one lot at hand, the ewes that have lambed will get their exercise in caring for their lambs. After a large part of the ewes have lambed, a part of the vacant side may be partitioned off and ewes and lambs put therein.

Water ought to be in each part.

There is not one mortise or tenon in this frame nor any feature that cannot be readily understood by any "saw and

Fig. 8 is an after thought, and shows that by making the outer posts also ten feet high the roof will be raised two feet, and the storage capacity of the mow increased over five tons, giving about 17 tons about right for a flock of 100 ewes of the mutton breeds. The labor of building with the additional height will be the same, and the extra cost of 288 feet of siding.

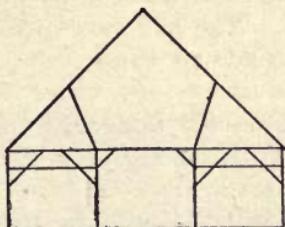
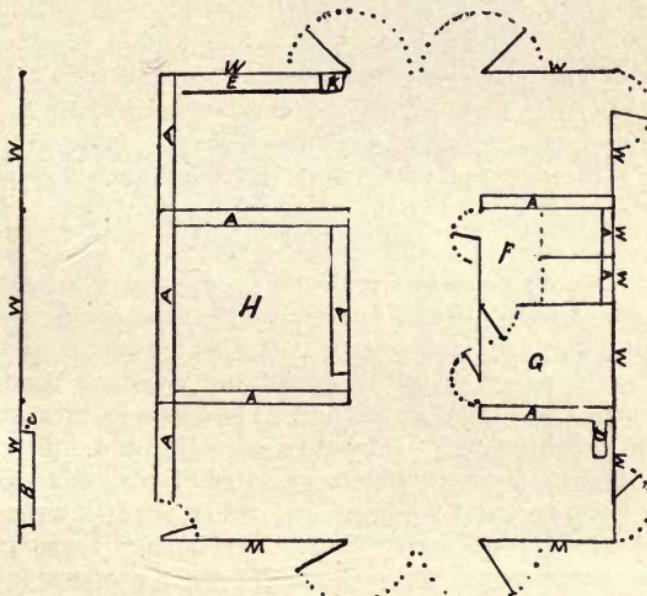


Fig. 8.

MR. VESTAL'S BARN.

Mr. W. B. Vestal of Indiana gives us this ground plan of his barn which has some excellent points:

The building is 62x48 feet, fronts south, is twelve feet at the eaves and is 27 feet to the hay carrier, which extends



the whole length of the building. Hay is unloaded from center driveway; both drives are 14 ft. wide. The center drive is open to the roof and cupola to afford ventilation. The mows are 8 ft. high. The west drive has floor over the center, leaving a space of 14 ft. at each end open to the roof.

Ample ventilation, without draughts, is greatly to be desired in a sheep barn.

The hay racks, A, are built with flat bottom troughs in front, to catch scraps of hay and to feed grain in bad weather. B, water trough. C, well. D, dipping tub. E, shearing table. F, hospital. G, nursery. H, feeding place for lambs, entered by creeps. K, closet, large enough to hold all the tools and instruments required about a sheep barn, so that they may be found when wanted. If ear tabs, worm powders, cordial, and some sheep dip are constantly kept in stock, it will save both time and sheep. The distance all being the same, a 14 ft. gate, which will lift off the hinges, may be placed at any desired point, to divide the flock into as many lots as may be desired, and a great many combinations may be had with a couple of light gates and a little thought. A gate placed in middle of center drive, or at post opposite hospital door, and one midway the water trough, will divide the room about equally and allow both access to water. The top half of the doors are on rollers, the lower on hinges. The doors may be fastened open and the gate hung in doorway. This barn will accommodate 125 breeding ewes, and hay enough to see them through. If more storage room is needed for hay, build it higher and it will look better.

SHEPHERD DOGS.

The Collie dogs are remarkable for great intelligence, an instinct which seems sometimes to surpass reason; wonderful endurance, and activity. Without these dogs, sheep-keeping in many districts, useful for no other branch of agriculture, would be impossible. The home of this breed is the Scotch highlands, a locality of rocks and hills, interspersed with grassy valleys; elevated tablelands bearing scanty herbage, and "moors," or level or slightly undulating tracts covered with gorse, heather, low bushes, boggy places, and scattered rocks. Upon these hills sheep are kept in large flocks, exposed from day to day to all the vicissitudes of storms, mists, rains, and snows, with no other shelter than is afforded by the lee side of abrupt precipices, overhanging rocks, stone walls, or in rough sheds of poles and heather. Without his dogs the shepherd would be helpless to manage his flock in this rough country. In countries where arable



“UNA” FAMOUS COLLIE, BRED AND OWNED BY ASPHODEL KENNELS, CUMMINGTON, MASS.

land bears a very high price, only such land as cannot be plowed is given up to sheep pastures, and here the dog is invaluable; and not only here, for he is made useful upon the more civilized hillsides of the Scotch lowlands; upon the grassy downs of England, the rich farms where sheep-keeping is only incident to high culture, and upon our own Western plains. Everywhere, where sheep are kept, a sheep dog of some kind is found useful; and of all the different varieties the Collie is considered the most valuable. He possesses a rare instinct for his work, which comes as a second nature to him. He often knows the ways of sheep better than his master, and understands the signals of the shepherd when far out of hearing, with great precision. Cases have been known in which the dog has discovered the absence of some laggards of the flock which his master had not missed, and has returned to the pasture for them unbidden. He can range his flock upon one side of a road, when meeting other sheep, and thus keep them from intermingling with the strangers. He will discover by his acute sense of smell sheep that have been overwhelmed in snow-drifts, and will conduct the shepherd to the place. If no help is available, he has been known to dig into the drift and release imprisoned sheep, and to warm chilled lambs by huddling close to them. He is valiant in their defence, and will give battle to a wolf without hesitation. No vagrant dog will be permitted to approach a flock of which he has charge. He will bring back stragglers when upon the march, and will return to find sore-footed ones that have lingered by the way. For a farm dog he is of special value, as he can easily be trained to manage with gentleness any kind of live-stock. He is domestic in his habits. While kind and affectionate to his owner, and his herds, he is watchful and suspicious of strangers and strange animals. His good disposition gives him great influence over his charge, and causes them to have confidence in him. When a flock is afraid of the shepherd's dog, it shows wrong management on the part of the shepherd, and that the dog has been badly trained. The Collie has long and woolly hair; a bright mild eye; a sharp nose; an intelligent aspect; a long bushy tail, curling upwards, with the end clear of the ground; and in color is usually black and tan, variegated with a little white. Not the least

wonderful or useful characteristic of the dog is his tenacious memory, by which he is able to remember all the turning points in a journey of hundreds of miles, and to recognize at sight every member of the flock to which he has become attached. With all his good qualifications, however, he sometimes lapses from virtue; and no other dog is so destructive in the fold as a sheep dog become demoralized by bad companions. The Scotch and English shepherds set great store by their dogs, and trials of his sagacity and special training, made at the numerous fairs are a matter for amazement by those not fully acquainted with his skill in managing the wildest sheep. These competitions are exciting as well as amusing. We have seen him engaged in driving into a small pen, a bunch of the wildest sheep known, doubtless, the small agile Welsh mountain breed whose jumping abilities are amazing. The test of the dog's ingenuity and natural acuteness is made by giving him half a dozen of these nimble and willful animals, in an open field, to drive into a pen with but one narrow opening. The dog is always the victor in these matches, between the two most sagacious of all animals. The patient skill of the intelligent animal in penning the sheep, in spite of their unwillingness, is worth crossing the ocean to see.

Unfortunately for him, he is subject to one of the worst of diseases by which he is made a natural enemy of the sheep he watches over so well. This is the tapeworm of several species, which he harbors in his intestines, and which by one of the most curious of natural transformations and transmigrations, pass from the dog to the sheep. But it is no difficult matter to relieve him of this parasite. This is to give him at stated intervals, as is mentioned in the chapter on diseases of the sheep, regular doses of worm medicine, keeping him shut in during the operation of it, so that the worms he discharges may be effectually destroyed.

The shepherd's dog is indispensable to the shepherd, but in procuring an animal it is necessary to get one well bred, and trained if necessary, or the expected assistant may turn out to be the worst enemy the flock may encounter. The pure breed only should be procured, for a cross bred dog may be really a damage to the flock instead of its friend and protector.

CHAPTER VI.

WOOL: ITS HISTORY, USES, NATURE, CULTURE AND DISEASE.

Wool is a modified form of hair. It is distinguished from hair, however, by certain special and prominent characteristics, while retaining to some extent other properties which are common to the natural covering of all animals. It has precisely the same chemical composition as skin, hair, and the feathers of birds, having as these have about 16 per cent of nitrogen and 4 per cent of sulphur. It is distinctly a growth from the skin, being rooted in it, and drawing its nutriment from it, and partaking with it in precise sympathy its prosperity and adversity; growing luxuriantly, and in its best form, in health; but equally suffering with it in sickness and disease.

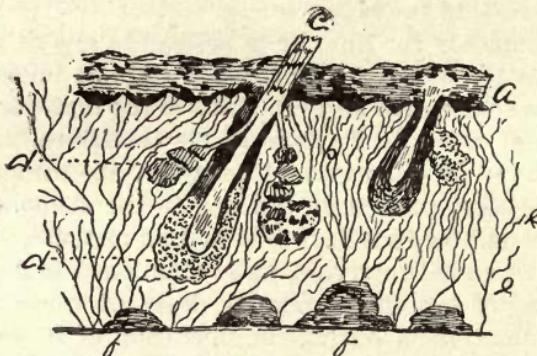


FIG. 1.

a, Epidermis, or surface skin. *b*, Dermis, or true skin.
c, Fiber of wool, with its follicles. *d, d*, Nutritive glands.
e, e, Capillary blood vessels. *f, f*, Masses of fatty tissue.
(Magnified 500 diameters.)

Its manner of growth is peculiar. Its root is a bulb which is inserted in what is called a follicle of the skin, as shown in figure 1. It is not deeply planted, and is thus subject to serious injury under what might be thought quite

immaterial circumstances. Indeed, its sympathetic action is so closely concerned with the condition of the skin, that it might be said truthfully that it keeps a constant periodical record of the daily changes in the health or welfare of the sheep. Every failure in the sheep's condition is marked by a weak spot in the fiber of the fleece, and when this is at all serious, these weak spots are so considerably developed as to weaken the fibers and cause them to break easily, and thus greatly lessen the value of the wool for manufacturers.

As with many other things, modern science disproves the old belief that wool, as well as hair, has the form of a tube. This was always stated in the old works on the sheep, and its care and management; but now relegated, by more exact knowledge, to that heap, or waste pile of errors, which gradually accumulates as we learn more of the nature of things through our more exact scientific instruments. The modern process of dividing objects for examination by improved microscopes, and by which we can cut sections or objects to a thinness of the thousandth part of an inch or less, and magnify them a million times with our better knowledge of the effects of light, has proved to us that hair and wool are solid and not tubular, but that they have a central core, as it were, which is covered by a distinct epidermis or outer covering, smooth and brilliant in hair, but in wool serrated and covered with scales having sharp entangling points or hooks, by which the fibers, under certain conditions, become closely intertwined and entangled, forming a tough, elastic fabric which we know as felt; the common material for making hats. This fact is not only interesting to the shepherd to know, but useful, as furnishing admonition to him to avoid these conditions which are very easy to occur in the care of a flock, by which the wool undergoes this very injurious process and is thus seriously reduced in value to the manufacturer.

But wool, while it retains these normal relations, and peculiarities, of form, yet varies very much in the different breeds of wool bearers. Indeed, this variation is so considerable, that it is an indispensable necessity for the survival of an enormous industry in manufacturing wool for various kinds of clothing, that the culture of it, as a special

product, has become—if indeed it has not been so even from pre-historic times—the chief object of the shepherd. And this objective necessity of the shepherd has made it indispensable that the professional breeder—if he himself is not an expert in this line of his business—must give much thought and study to the nature and product of the flocks, as well as the changing fashions in clothing fabrics needing wool. And the breeder must so develop needed changes in the sheep as to meet all the demands of the manufacturer, who only reflects the tastes and fashions of the general public who consume the goods he makes. The shepherd then and thus is not in precise control of the world, but he is the servant and purveyor for it in this regard, and he must keep in the front as the procession passes by, as may be said, and conform his movements to those of the irresistible mass of the public.

There was a time when the Merino was the only kind of civilized domestic sheep. It furnished the fine wools which were spun and woven by the noble women of the most ancient times. For in one of the earliest written books, in which we have the history of Job, we find the excellent mistress of a noble household providing in this way for her dependants. So the noble ladies of Rome spun and wove the luxuriant woolen robes, and dyed them for their husbands and fathers and brothers in the costly Syrian purple. And this custom gave origin to our common term for unmarried women, viz., spinsters. And to this day the Merino—then the only domesticated sheep—holds the front place among the wool bearers of the world, counting more than five-sevenths of the whole number of sheep now existing. But since these ancient days the constant progress in civilization, and practical comfort growing out of it, has greatly varied the demand for woolen goods; and for some centuries past breeders have given their attention to the development of breeds of coarser wooled sheep. Thus the Cotswold—originated from a Spanish coarse-wooled variety—and the native English sheep, were improved gradually, until the beautiful Southdown was developed and perfected, and became the progenitor of most of our excellent short and middle wool sheep of what are commonly known as the Down breeds. And so this constantly improved cul-

ture of the sheep continued with the result of giving us the comparatively large variety now in the hands of breeders, with the constantly increasing number of flocks in the hands of shepherds.

It should be noted right here, that the chief object of the American shepherd, as also that of every other civilized country, except England, has been the production of wool; while that of the English shepherd has been the mutton. It has happened, however, that in the pursuit of the best mutton in the world the English shepherds have brought into existence an invaluable class of wool sheep, now more than ever to be considered because the coarser and longer staple has been generally adopted as the material for clothing. And the American shepherd, once a wool grower only, has now to meet the rapidly increasing demand of the most populous civilized nation in the world for choice mutton, the most nutritious and pleasant flesh food existing, besides catering in the same line for the foreign consumers. So that we here have two objects to pursue, each of which will tend to the profit of American breeders and shepherds. And let us here once more remark, as a very important fact, that in this industry, based on the sheep as a source of profit, there must be two distinct interests; that is to say, the shepherd as a producer of the final products of the sheep; and the breeder as the source from which must be procured the materials for the shepherd to work with. For there must be a higher and more cultivated designer to prepare the materials for the actual worker, which the shepherd is and always must be. And his materials must be the cheap sheep to supply the mutton and the wool, crossed with the high-bred and cultivated, improved rams, of pure blood, constantly improved and varied as the needs of the markets, and also of the shepherds—who cater for the markets—may call for. For breeding is an exact science, to be studied by experts, and a costly business which is above the limit of the ability of the shepherd. In time we shall doubtless adopt the methods of the German breeders, who employ experts to advise them and help them choose the materials for reinforcing their flocks, in regard to the maintenance of a necessary high standard of excellence in form, size, quality of flesh, and value of fleece; not neglecting the neces-

sary constitution requisite for a breeder. And while the breeder studies very carefully the form and constitution of his favorite breed, he will not act wisely if he neglects the influence of breeding upon the quality of the wool. For this result of cross breeding for variety of wool has been found exceedingly effective in modifying the character of the fleece and adding to its value for the manufacture of important varieties of fabrics.

We cannot follow down the ages the full history of wool. It may be sufficient to merely show how it thrived in the most ancient times from the very beginning of human life on the face of the earth, accompanying the savage man whose home was in caves, and gradually advancing with him as he approached civilization, until the first written history of our race originated. Then we find the ancient sheep-skin was changed for clothing of wool, and the fleeces were a large part of the early merchandise of the world. Then wealth was estimated by the numbers of the flocks, while the sheep became the most valuable offering that could be made as the sacrifice to the highest objects of worship.

As this ancient civilization advanced, the sheep—we may be sure—was brought under most careful cultivation, and wealthy nobles of the nations were noted for the number of their flocks. This advance, however, was lost to a great extent during that time of anarchy and slaughter which we know as the dark ages, in which, however, the sheep and its wool nevertheless continued as a valuable possession and necessity of life; for the heavy ransoms of captives made in those continuous wars were frequently made in sheep and wool, and such merchandise as then existed consisted largely of bales of wool.

Indeed, at that period of our race, we know that the shepherds seemed to control such governments as could exist during such turbulent times; and the Shepherd Kings, with their shepherd followers, led the world for a considerable time during which a sort of nomadic life prevailed. And as the dark ages passed the sheep survived, and when some sort of settled life became possible, it remained as one of the most valued possessions of our race. Thus in course of ages the sheep survived, in time to become the leading pur-

suit of such permanent nations as were formed out of the remnants of governments which escaped extermination, and an indispensable accompaniment of the gradually improving civilized agriculture.

It may be easily thought that the most powerful communities settled as permanent nations, gradually improved their flocks until in more recent times friendly governments—as an indication of good will—presented selected flocks to others, who received these gifts with avidity and exercised great care to distribute them among the leading owners of the cultivated lands. It was in this way that the best sheep of Spain, where it seems that the flocks had been most carefully preserved and improved, were distributed and became the progenitors of such breeds as our present improved Merinos, Cotswolds and Southdowns, which are really the original ancestors of all our present existing varieties.

Still wool was the main object of solicitude, and leading breeders gave the closest attention to the improvement of sheep as wool producers. The rest is a matter of modern history, and after all we are still at work in the same line, and shall doubtless always be so, for we cannot realize any such thought that the world can ever exist as the home of civilized communities without the sheep as one, if not the first of agricultural pursuits.

These being the facts before us, it is necessarily the business of the shepherd to give his attention to the best management of his flocks for the wool product, to the practical understanding of the character of this staple, and the best means of preserving its quality and increasing its value by the most judicious culture of the sheep.

THE NATURE OF WOOL.

The chief value of wool depends on its peculiar character, and its adaptation to the various processes of manufacture; for its usefulness in this respect depends on its peculiar structure.

A fiber of wool, when examined under a powerful microscope, is seen to consist of three parts: first, a central core consisting of what is termed medullary substance. This is a sort of fatty matter akin to the marrow of a bone, and

having the property of giving a softness and elasticity to the fiber which is one of the distinguishing features of wool. Over this central core is the second layer called the corticle substance. This is the fibrous part of the fiber, to which its strength is due. It contains the coloring matter. It is really a fibrous thread and is striped lengthwise. This fiber grows from the root which is seated in the nutritive follicle in the lower skin. It has such a formation as gives to it the waved and spiral character, and causes it to twist easily and become matted together under certain processes known as felting. It also enables it to sustain and preserve the twist which is given to it in the process of spinning. But the most remarkable and special feature of wool is its outer covering.

This outer covering consists of pointed scales, the extremities of which are sharp. These are arranged around the fiber in spirals.



FIG. 2.



FIG. 3.



FIG. 4.



FIG. 5.

Fig. 2, Fiber of Merino wool.

Fig. 3, Cross section through a fiber of Merino wool.

Fig. 4, Single fiber of Merino wool. Fig. 5, Lock of Merino wool.

Fig. 2. The sharp points are more distinctly shown at fig. 3, which represents a fiber of wool cut down the center. But all kinds of wool are not precisely alike in this respect. Fine wools as that of any one of the Merinos, are more liberally furnished with these serrations than other kinds. In the finest Saxony wool these number as many as 2,800 to the single inch. Wool of the finest Southdown has about 2,000; and of the Leicester about 1,800. The fine wool, too, has a much more wavy disposition, as is shown at figures 4 and 5. This selection of illustrations has been made for the purpose of explaining the peculiar property

possessed by wools of this class, known as felting, or adhering together in a mass, by the interlacing of the fibers when passed through a special process. It also goes to illustrate the facility with which wool on the sheep's back may undergo this adherent process when it is damp, and by reason of its elasticity, and the pressure due to the sheep huddling together, and chafing the wool as well as by the influence of the dissolved yolk—all these being accessory—the fleece felts, or as we say, becomes cotted. This of course is a serious damage; for in the carding of such wool it is torn into shreds; even into dust when it is in bad condition; and is worthless for any but the lowest qualities of goods.

But yet this peculiar character and structure of wool is of the utmost importance in its manufacture. For when it is carded and torn into innumerable short lengths, these intertwine, and when the wool is spun it becomes aggregated into a thread of great strength and elasticity. It is to this natural peculiarity of fine wool, in excess of other kinds, that it is more highly valued for the finer class of goods which are known as broad cloths.

Moreover it is to this peculiar nature of wool that it may be spun into such fine threads, that one pound of the finest reaches a length of very nearly one hundred miles. This all goes to show the necessity for every wool grower to study the final uses of his products that he may secure the greatest profit in the higher prices he may obtain for the finest of them. It is also of interest to know precisely what the fulling process is that is applied to the finishing of the fine cloths made from the best qualities of Merino fleeces.

This process consists of oiling the wool, and then spinning and weaving it into the cloth. The cloth is then freed from the oil by steeping it in a mixture of a fine sort of alkaline clay, known as fuller's earth. This is followed by pressing the cloth, which of course brings the fibers into close proximity, and causes them to mat together by their sharp hooked scales, thus forming a firm, dense fabric. Afterwards being torn on the surface by a set of teasels fitted in a frame, a fine velvety nap is raised on the cloth, which retains the glossy texture of the wool. Only the finest of the Merino wools are thus treated. This result of moisture, grease, and pressure, with some considerable warmth, is sometimes ex-

perienced on the sheep, which are permitted to crowd in close pens after the fleeces have been soaked with rain. The fleece then mats in spots to the serious injury of it for the manufacturer's use.

The different breeds vary very much in regard to the character of the fleece. The length varies from one inch in some parts of the finest Saxony and French Merinos, to eight or more inches in the Lincolns. The fineness varies as has been mentioned above. The luster also differs, that of the Lincoln wool and the best of the Leicester, being much brighter than the short wools or the fine Merino fleeces. The curl also varies considerably; that of the Merino being the most conspicuous. The serrations are much more numerous in the finest wools while they are far less prominent and inferior in number in the long and more lustrous varieties. Thus it is that each kind of wool has its special uses in manufacturing, and as the demands of the manufacturers, to meet the necessities of the markets for their products are constantly changing, as the fashions change, there is a concurrent demand for varieties of wools that can only be met by cross breeding, skillfully managed by intelligent and experienced wool growers. This necessity for increased varieties thus opens up a wide field for the wool grower in the direction of breeding for some special variety of wool, and thus has to be met by intelligent crossing of such breeds of sheep as will meet the necessities of each case.

CROSS BREEDING FOR WOOL.

As may be well thought from the remarks in a preceding chapter on breeding of sheep, and especially on cross breeding, the special breeding for variety of fleece must be undertaken only by experts, to whom the whole subject is familiar. That is, those having a full general acquaintance with not only the history of the breeding of sheep but also of the nature and varieties of wool, and as well as of the prepotent ability of the various breeds in regard to the perpetuation in this line of their individual characteristics. One of the old breeders in his day very truly remarked, that the sheep breeder works with sharp-edged tools, with which he may very easily destroy his whole work by a slip of the hand,

as it were. This is essentially true, as has been shown by the numerous failures made by inexperienced breeders of this most easily impressed animal, whether for good or ill. And if this be true, as regards the sheep as a mere mutton maker, it must be still more so in regard to it as a wool producer. And yet by following strictly along the right line of the skillful and experienced breeder, there is a most important work to be done in the variation and improvement of the fleece. We know what has been accomplished by the skill of the breeders in improving the carcass of the various sheep, and in developing new breeds by mixture of the new breeds with the old and inferior ones; and it is not to be doubted that equal improvement and variety in the fleece may be accomplished in a similar way by crossing for the product of new staples of wool for the demands of the manufacturers. The following remarks on this important subject were published a short time ago in the columns of the *Country Gentleman*—the leading agricultural journal in the world—the editor of which has very kindly and courteously given permission for the reproduction of the articles in this volume:*

"The future of the wool industry, including both the growth of the staple and the manufacture of it, must be large and continuous. The progress of civilization among the hitherto savage human races will undoubtedly be much more rapid in the future than ever before, and the dark ages of these unfortunate people are in course of rapid removal by means of commerce, and the competition of powerful nations for spheres of influence in the newly opened regions of the dark continent. Of the whole of our race, only one-third are really clothed, one-third go completely naked, and the other third wear only the modest breech clout. But of the third who are considered as clothed, fully three-fourths are only insufficiently supplied with clothing, and luxury to them in this respect is a thing unknown and undreamed of. So that an enormous growth of the wool industry is in certain sight, and all the resources of the shepherd will soon be taxed to supply these certain demands. History repeats itself, and as the dark ages of Europe and Asia have gone, and comfort and luxury, the growth of peace and civilized industry, have taken the place of bloody anarchy and pov-

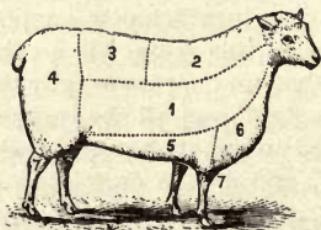
*These articles were contributed to the *Country Gentleman* by the author.

erty, so the condition of now savage races will be in time changed for one of comparative civilization in which mankind become purchasers of manufactured articles, and good clothing is the second necessity of life.

What does the impending change mean to the owners of flocks and the manufacturers of woolen goods? Nothing less than a steadily increasing demand for wools, and that of many grades suited for all demands of necessity or fashion. We must produce more wool, and a greater variety of it, and this means an increase of flocks, and an intelligent study of the nature of the sheep's fleece, and the possibility of variation of it by judicious crossing, and possibly of the establishment of new breeds for this purpose.

Wool is now differentiated by breed, and by the parts of the sheep's body. It must not be supposed that the whole body of a sheep bears the same kind and quality of wool. This would be a wholly mistaken idea, and one that would stand prominently in the way of any intelligent consideration of this subject. And this is one of the most important things for the wool grower to study when he is thinking of improving his wool-bearers. The diagram here given will represent the difference in the quality of the wool of any one of the Down breeds, and approximately of that in a Merino. For the quality of the fleece is yet dependent to a large extent on the form of the frame even of the most highly bred Merinos, and it will be centuries, perhaps, before the most skillful breeder will be able, if ever, to overcome the tendency to this local variation in wool. Hence the wool-sorter's occupation will still remain, until by successful crossing and long continued breeding the whole carcass may bear wool of a high value if this were desirable. That it will be desirable to the wool-grower seems to be certain, although there is a necessity for many grades for the manufacturer.

The wool from the center of the sides, marked 1 in the illustration is of the finest quality. At 2 and 3 the fleece becomes coarser and shorter, and as the breech is ap-



proached, at 4, this coarseness, and length, too, are increased. The most inferior part of the fleece is on the belly and brisket, as at 5 and 6, that on the legs being almost like hair. Every Merino breeder will know how much has been done with that breed in bringing the fleece to a more even sameness of quality, for in some of the Merinos the belly wool is much better than in the Down breeds, and the leg wool is wool down to the hoofs. This exemplifies the possibility that exists in the improvement of sheep by successful crossing. The wool buyer takes note of this difference, and it is this, which he recognizes by feeling when he handles the fleece, that causes him to give a better price for the fleeces of one flock than he will give for others. This is one of the essential points to be considered in choosing the rams to be used in crossing as well as in selecting the flock of ewes.

That cross-bred sheep must be the main dependence of the wool grower is as certain as an axiom. There is not a sufficient supply of pure bred sheep to produce all the wool required, and there never will be any sufficient uniformity in the pure bred sheep to keep the staple of even quality. Many breeders make many breeds; even of one race. We cannot keep twenty flocks of any breed all started alike, and from the same origin, all alike and without sensible change for ten years, but in that short time these flocks will exhibit surprising differences. This is very well known to breeders, who must exercise the most rigid selection to keep their standard of excellence intact. Thus the slaughter-house is one of the absolute necessities of the successful breeder, and as there are weeds in flocks as in fields, the weeding of the breeder is as necessary for his success as is that of the farmer or gardener to them. But, divide a flock into twenty, and put these divisions into separate hands, and all skilled to some extent, and there will be as many different flocks in ten years. Thus the breeder's occupation will remain, as indispensable to the integrity of any breed, and the wool grower will improve his wool by crossing native sheep or grades, gradually getting nearer to the pure bred fleece, but never up to it, by the use of pure bred rams selected judiciously to mate his ewes.

These facts will show the importance of the wool grower

having an ideal. And also of having such an acquaintance with sheep as will enable him to reach his objective point most readily. The majority of wool growers will not be breeders, that is, working skillfully for the creation of some new breed or strain, that will become fixed in time; and this for the reason that we have now as many breeds as will supply all demands for wool, and if any new evolution shall ever occur in the wool trade, this will be so gradual that it may doubtless be met by a parallel change in the product. It is evident to any one who is in touch with both these departments of the wool business, that we need to produce more of that class of wool that comes from high grade Merinos crossed upon other and coarser wooled sheep, and this for the purpose of getting the finest of the Merino, with the heavier fleece from the heavier carcasses of sheep, that will supply mutton. And for the too numerous natives, we want the improvement by the Merinos for the supply of these grades. And the wool grower who has mastered all the intricacies of his business will purchase his grades and the rams, and thus furnish a market for the first hand sheep—the improved natives. And this should bring us to the English system of great sheep markets, where a hundred thousand head or more may be found at the right time for the purposes of the purchaser in each locality where this business is carried on. We have needed these markets, and the want of them is an obstacle in the way of making wool growing as popular as it should be. It cannot be doubted that America is soon to become the greatest sheep and wool producing country of the world, and with this product of the raw material, there must be a corresponding enlargement of manufacturing. This consummation will make necessary two classes of shepherds—the breeders of high grade sheep, and those of pure-bred rams for one; and for the second the breeders for wool and mutton by crossing.

Sir Walter Scott, in his story of the Black Dwarf, represents no doubt an actual occurrence in the conversation between two Scotch shepherds of his day, in which both agreed that "it was the *woo'* that paid the rent." By which it may be understood that it was the clear profit of the flock, the cost being paid by the mutton. And the same may be said to-day.

This is consistent with reason, if we had not the experience of 2,000 years to support this common belief. Wool is a product of human ingenuity and skill. The sheep is a gift of nature as the wild fruits are, but the fleece is the result of culture, as are the sweet and luscious fruits produced by the art of the grower. And it is all the more easy to effect whatever purpose may be desired in this way because of the plastic nature of this most easily influenced animal. One of the most prominent sheep-breeders of England once said: "You may chalk out upon a wall a perfect form of a sheep and then go to work and give it existence by means of breeding and culture." The same is equally applicable to the fleece as to the mere animal frame. Every existing breed of sheep has been differentiated from the wild races by human agency. More than 2,000 years ago the fine fleece of the Merino was evolved by the painstaking culture of the wealthy Roman proprietors of Spanish lands, from a native race theretofore unheard of. But the demands of wealth and luxury gave the impetus, to which the products of the Roman matron's distaff and looms soon became accessory, by which the luxurious imperial robes and soft attire of the Roman ladies were derived from the ancient Merinos of conquered Spain. And from that day to this the plastic nature of the sheep has enabled the breeders from their chalked-out patterns to bring into existence the Electoral race of Germany; the Naz sheep of France with their exquisitely fine fleeces only 24 ounces in weight, and an inch or less in length of fiber; as well as the largest of its kind—the French Rambouillet—with its 30-lb. fleece of wool 5 inches long. And between these comes the American Merino, the best sheep of its kind in the world, as the product of the best mind and skill in the world, for in this no other country surpasses ours, and this sheep has gone wherever Merinos are bred for the improvement of other related races.

Thus I hazard the statement, the result of long experience, and study of the sheep, and from the laws of breeding that are accepted by all breeders, that the Merino must take the first place in the crossing of all inferior breeds for the production of the best wools for the staple manufactures that come between the long coarse, and the short fine, fleeces, and for which the demand is now greater than ever.

and promises so to continue. The more than 2,000 years of successive breeding gives to this sheep the greatest prepotency, and thus the males have always been found to exert the most conspicuous effect upon other sheep bred to them. The wool, too, is so firmly established in its character that the produce of a cross has from the first a close resemblance to the wool of the sire, and after two or three crosses it becomes to all purposes a Merino wool. But for the improvement of the coarser-wooled sheep the selection of the rams is the most important matter to consider. We must here revert to the principle involved for a rule of practice. It is really a scientific, almost a mathematical problem, as thus: given a certain value to be decreased in quantity by division or subtraction, then the larger the value of this quantity and the less that of the other to be taken from it the greater the value of the remainder. The Merino ram has greatest natural force, due to its long inheritance, while the ewes chosen have less but a greater natural susceptibility. For instance in all improved breeding of whatever animals we do not put a thoroughbred dam to a scrub sire, but the reverse, and in six such crosses we think we have a progeny in all material respects equal, except for breeding, to the sires. It is the progeny of the pure bull and the common cow that makes the valuable grade for the dairy or the butcher, but no one thinks of reversing this method except when the breeder of sheep, wanting to refine the fleece, does this, and makes the coarse wool the top cross and makes a certain failure. For in most of the efforts to make a cross-bred sheep the larger coarse-wooled ram has been put to the Merino instead of reversing this, and getting the prepotent effect just in the line desired.

The Merino has the fine fleece, and the weight of it. It has the extreme hardiness; rams of this breed have lived and served in the flock to the age of 26 years. The writer had one 13 years, when it fell a victim to the wandering cur. And it had the potency of its lineage. Hence for the improvement of wool with any kind of ewes it may be the first choice. Doubtless the cause of most of the failures in attempts at crossing with this breed has been the mistake of making this strong breed the under cross. Such a failure was made by a French breeder with the Merino crossed by

the Leicester, but the error was quickly discovered and rectified. The produce was an animal as small as the Merino, and having a light, open fleece, short like the dam's. It was wrong both ways, as might have been expected. The small dam brought a small lamb, and the loose fleece of the ram only lightened without lengthening that of the cross. But on reversing the method an excellent cross was procured, having a 10-lb. fleece as fine as that of the sire, and a lamb that at two years old made as much weight as the Merino at three years.

The cross of the mutton breeds on the Merino has been productive of weakness in the offspring. Its effect is to lengthen the staple without increasing its density, and the want of constitution spoiled the sheep itself. But the reverse cross has been all the other way. This will be better shown in the next article when illustrations of cross-bred wool will be given. Density in the fleece is necessary for protection from stress of weather, and from excess of dirt; it also gives the weight desired. The Merino also confers the yolkiness upon the fleece, which is one valuable agent for the protection of the wool in every way. Thus it has been found that the most wrinkly and yolky of the large Merinos make the best cross on the Downs and the long-wools. And this is the more reasonable because these wrinkled sheep are the possessors of the naturally strong constitution of the race, and have not been bred down to secure a change of natural character.

The large Merino then is also the ram for improving the common native ewe. It may be quite possible that a first cross of the smaller Merino might be better as a start for this purpose, but so far, excellent results have been gained by this cross. This cross will then be continued, for there is nothing in the dam worth perpetuating, and the high grade will be kept as a permanent flock, but always with a pure ram for its leader.

In all the pursuits of life, whether intellectual, mechanical or industrial, each person must have an ideal which is to be the ultimate object in view, and for the attainment of which the nature and variations of this ideal are to be clearly understood. Thus the sheep breeder, whether his object may be the carcass for mutton, or the fleece for wool,

must chalk out, so to speak, the ideal before him, and then devote every effort to attain this end. The wool grower must then know something about the nature of his product, its special character, its differentiations under varying circumstances, and as well the needs of the manufacturer of his staple, and the results upon the quality of it of mistakes or accidents in the management of the flocks.

Heretofore the precise nature of wool has been only superficially or erroneously described in the books that have been taken as authorities. It is only necessary to examine the various illustrations given in such pretentious works as the encyclopedias, to perceive how little has been known,

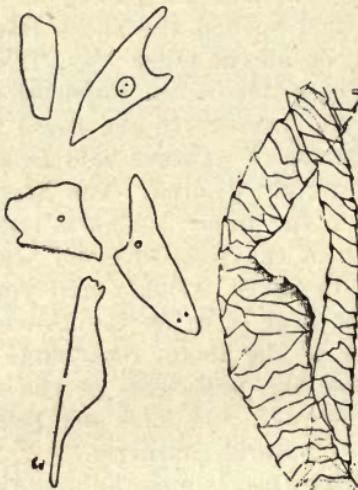


FIG. 6.—Outer scales of wool.

Diseased wool.

through what might be called popular science, of the character of wool; and as far as the possibility of a breeder of sheep or a wool grower getting any fair notion of what wool is, the student might as well examine the structure of a rope or a chain cable, to get an idea of that of a silk ribbon. The regular and methodically-placed imbrications upon the fiber, alternating equally like shingles on a roof, are mere creations of the imagination, due to imperfect study of the fiber under an inferior microscope, that is inexcusable in any modern work. Instead of this regularity of position and consistency of form in these imbrications, there is a great variation in both respects, as may be seen in the

accompanying drawings, of which fig. 6 represents the scales on the outside of the fiber, fig. 7 the cross section of the fiber, fig. 8 the greatly magnified cross section of the interior fibers with the outer scales; fig. 9 a fiber of Merino, and fig. 10 one of Cotswold wool.

The epithelial scales (fig. 6) are seen to be exceedingly irregular in shape, and being laid around the wool, they give the appearance to it as shown at figs. 9 and 10. In the drawing of Merino wool, the longitudinal fibers which are seen endwise in figs. 7 and 8 are to be seen, and in fig. 10 is shown the dark pigmentary matter that is a special mark of the Cotswold fleece, and which will be more particularly mentioned hereafter as having a special reference to the detection of Cotswold blood in various cross-bred sheep having more or less of this blood in them.



FIG. 7.—Cross section of fibers. FIG. 8.—Cross section magnified.

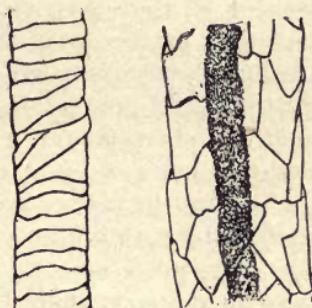


FIG. 9.—Fiber of Merino wool.

FIG. 10.

The character of wools of different breeds varies greatly—so much so that by a careful study of them, and some practical experience, the breeder may gather much information as to the purity of his flock, and with what breed it may have been mixed. And this special characteristic of the fiber is easily seen to be a most important element in this study of cross-breeding, for the quality of the fleece is everything to the manufacturer, and equally so to the wool grower who sells his fleeces to him for what they are worth as a staple for the goods made, and as well, it may be said, as to the healthful and perfect growth of the staple. This is also very important. At fig. 6 is shown a fiber of Southdown wool that is imperfect by reason of some defect in the condition of the

sheep. Wool grows from the skin. Every day the tip of the fiber is pushed higher from its base by the daily growth. Its substance is derived directly from the skin, certain secretions from it supplying the bulb or root of the fiber, that is imbedded in what are known as the hair (and of course wool) follicles (see fig. 1). The precise nature of wool may be learned from these figures:

	Composition of—			
	Skin.	Wool.	Hair	Horn.
Carbon	50.99	50.65	51.53	51.99
Hydrogen.....	7.07	7.03	6.69	6.72
Nitrogen	18.72	17.71	17.94	17.28
Oxygen and sulphur.....	23.22	24.61	23.84	24.01

As nothing comes of nothing, and everything in the world is made up of elements that must be supplied to it for its growth, so with wool. If any part of its elements are wanting in the food, or is diverted by reason of some special disorder of the sheep from the nutrition of the skin, and from this, of the wool, there is a weak spot. The fiber is thin and defective in strength. If the food is in excess at any time, and production of blood is increased, the opposite condition prevails—for a time only, for excitement from whatever cause is sure to be followed by a corresponding relapse, and in such a case we find first a thickened fiber, followed by a thin and weak one. This may be for a short time only, as is seen in that part of the fiber on the left, while on the right there is an indication of some lengthened disturbance of the condition.

Wool is differentiated more especially by its serrated or imbricated surface, its length and fineness; and in the Merino by its peculiar waviness or crimp. And in these respects the different breeds vary so considerably that the expert shepherd or wool grower, as well as the wool-sorter and manufacturer, may be able with ease to distinguish the fleece of each breed. The biologist may even trace the mixture of blood far away back by these special peculiarities, and thus it is most important for the breeder to study this matter with care, and examine samples from his flock under some good microscope. It is even possible to distinguish in the wool of any pure-bred sheep the marks of any ancestor that might have had some special individual characteristic in this respect. This part of this interesting subject will be more fully dis-

cussed and illustrated in the next and concluding articles of this series.

Here we want to consider what the wool is, chiefly. The scales of which the outer part of the wool is made up, may be compared to those of a fish in the general manner of their position on the fiber. They all lie in one direction from the root of the fiber upwards, as the scales lie from the head to the tail of the fish; so that if one draws a lock of wool through the fingers, from the root end upward, the fibers slip smoothly through them. But if the wool is drawn from the tip to the root, the harshness and roughness is quite perceptible. These serrations are exceedingly small. In the finest Merino (Saxony) they number 2,800 to an inch; in the Leicester—as we shall see in time, it most closely resembles the Merino in the character of its fleece—these serrations are about 1,800 to the inch. These numbers refer to the points presented by the scales all around the fiber, and not to the margins of the individual scales, as shown in these illustrations, in which only the bordering lines are really shown. The coarser wools may have no more than 500 serrations to the inch.

The diameter of the finest Saxony fiber is from 1,500 to 1,800 to an inch. An average Merino fleece will be one 750th of an inch in diameter. Coarse carpet wool is about one 250th of an inch. This special fineness of the fiber, its serrated edge and crimp, are easily seen to have much to do with its value to the manufacturer, who may make of it the finest, softest and lightest goods. And as the Merino fleece may be taken as the basis of computation of value and fitness for use of all other wools, it may be readily perceived how the peculiarity of its wool may be graded down by judicious crossing so as to meet every need of the manufacturer for the largest variety of staples.

Had the manufacturer of the finest or the coarsest clothing fabrics, with all the experience, skill and ingenuity that the most accomplished could possess, set himself to invent a fiber just suited to his needs, he could scarcely have procured one that meets every want so well as wool, with all its points of adaptability, excellence and variability. And the wool-grower must perceive all this and guide himself in accordance with his knowledge in the pursuit of his indus-

try as a purveyor and producer to the manufacturer, so as to make available all these necessary points of adaptability for the varied uses of his product.

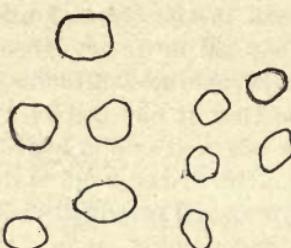


FIG. 11.—Southdown. Merino.



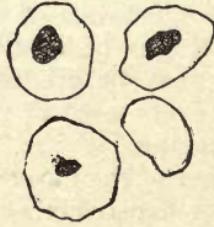
FIG. 12.—Leicester

Wool is generally of two classes—fine, short and carding wool, and long, coarse and combing wool. This distinction used to be more strict some years ago when Merino wools could not be combed, as some are now by improvements in machinery. But it still prevails, only the longer-wooled Delaine or French Merino is classed with the combing wools because of its longer fiber. The Merino and the Southdown represent the short-wool class, while the Leicester, Cotswold and Lincoln are types of the long wools, and the Shropshire, Hampshire and Oxford come between these two as middle wools.

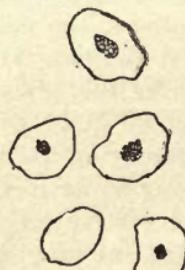
Each of these breeds has its special peculiarity to be studied for its own uses and value, and also for its adapta-



FIG. 13.—Lincoln.



Cotswold.



Oxford.

bility for crossing. It is a maxim among breeders that easy steps are more satisfactory than jumps in the union of breeds, and the more nearly the two varieties approach each other in character the better they "nick" together. Violent crosses are rarely satisfactory. In studying the three groups

of wools by their cross sections, as shown in figs. 11, 12 and 13, it will be seen that there is a nearer approach between 11 and 12 than between those in group 13, and that the Leicester and Southdown vary but little in the fiber from the Merino. It may be said here that in cross breeding these more closely related breeds have been mixed with far greater advantage than the more unlike breeds. And the Merino-Leicester alike in fineness of fiber and nearly approaching in other respects, has made the best of all the crosses that have been attempted between the short and long-wooled sheep.

So, too, it may be pointed out at this time, lest it may not be fully regarded hereafter, that the effect of the Cotswold on those other breeds upon which it has been crossed for some special object other than the fleece, has left its most distinguishing mark upon the other breeds, by its "dash of blood," as it is termed in the conspicuous central pigment cells that were originally a distinct mark of this most potent-blooded breed, and which to-day is so special a peculiarity of its fleece, as to mark the trace of its blood in all the breeds with which it has been mixed, and as a detector of impurity in their blood.

For the purpose of this discussion we may assume that there are only four really pure breeds of sheep concerned in the production of our present varieties. These are the Merino, which merits the distinction of being the oldest race in existence; the Cotswold, which comes next; the Southdown and the old Hampshire. These are all worthy of distinction because they have been the origin of all our present breeds. Perhaps we may leave out of this category the Merino, which stands alone as a special breed that has held a singular place in the world as the most valuable wool producer at any age, and is destined so to remain, except as in the future we may find it to be of the greatest value in the improvement of other sheep for the production of what may come to be called cross-bred wools.

Then we shall have the above mentioned three breeds, and possibly the old Lincoln (as the origin of the Leicester) might be thought to deserve a place and make out an even four, excluding the Merino. Every one of these has undergone such a course of improvement as to be wholly remodeled. This change has been due to mixture of new blood

to some extent, but mostly to the most skillful selection by the old breeders, who built up our finest races of cattle as well as these sheep. And the prepotency of these original breeds is shown by the comparison of the wool, and by tracing how the peculiar character of the fleeces has survived in the improved races. This evidence will show how it is by the fleece that may be traced the lineage of the newer breeds, and also give reason to believe that quite as great victories in this pursuit may yet remain to be achieved.

Attention is directed to the drawings of the wools named. The fibers have been magnified 310 diameters. The size of each is the average—some fibers may vary as much as 25 per cent either way. They may thus average about 1-650th to 1-800th of an inch in diameter. They come under the category of coarse wools. We may trace in these first the effect of the Southdown upon the old Hampshire, and perceive distinctly how the smoothness of the scales has modi-



FIG. 14.
Old Hampshire.



FIG. 20.
Southdown.



FIG. 21.
Cotswold.



FIG. 15.—New Hampshire.



FIG. 16.
Oxford.

fied the uneven and ill-formed epithelium of the old Hampshire, which we know was a large, bony, big-headed, coarse-wooled sheep that was fed by the Romans in Britain twenty centuries ago, and whose wool supplied the first factory erected by them, and worked on English soil. Looking at the fiber we can easily imagine what kind of a sheep this was; that it was not fed as well as the modern sheep, and thus the fiber was uneven in diameter, and rough and harsh and crowded in length.

In the study of the effects of crossing sheep for variety of wool we may take as the most prominent examples these two modern breeds, the Hampshire and the Oxford, two kinds of sheep classed among the so-called Down breeds. The former originated in a cross of a native white-faced, horned sheep kept in the district around the county of Hampshire in the south of England by a pure Southdown. This

cross is an example of what has been previously mentioned in a former article, viz., the prepotency of the pure and standard bred ram upon the ewe, for in this cross breed we find the white face and the thin fleece and the horns, as well as the ewe, changed for the black face, the close fleece, and the bare forehead of the improved race, now, by close breeding, having these points fixed and making a permanent characteristic of this breed, the new Hampshire. The drawings of the wools of the three breeds from which these two have been produced will show very clearly, as clear in fact as the form and appearance of the animals themselves do, how the influence of the ram has been exerted upon the fleece.

If we study the make-up of the pure Southdown wool and then that of the old Hampshire sheep, whose fleece was coarse and uneven in its fiber, and compare these with that of the new Hampshire, we can trace easily the mixture of the two bloods in the variation of the fiber; how it has become even, finer, and how it shows the half-way appearance of the imbrications between the two. Then comparing the last two, the Cotswold and the Oxford, we find distinctly the Oxford fleece to be equally affected by the influence of the more vigorous blood of the older breed in the same half-way appearance of the imbrications on the fiber and in the fineness of it. And in every instance we find these same results when the older and prepotent breed, because of its longer line of breeding, has been crossed on any other one. At the same time the under cross has always given its greater weight of fleece to the half-bred progeny.

Thus it is that this cross breeding is no haphazard business, but is a truly scientific operation, needing two or more elements in it, each of which is to be chosen advisedly, and with a distinct purpose, as indeed all breeding must be to be successful. One may as well expect to hit a mark with a rifle with his eyes shut as to try to effect any useful purpose in whatever line of breeding he may undertake without he first takes the pains to fix the purpose of the breeding, and then selects the materials with some well-defined view of what he is attempting to produce. Even then there may be disappointment, for it is not every animal in any specified breed that is sure to meet the hopes and expectations of the

breeder, and thus it is that there must be many failures to be disposed of and continual study and comparison of results before a satisfactory result may be attained. It is a life-work rather than a chance, and the assistance of the manufacturer who needs the wool for his special purpose should always be given in the work. The wool grower and the manufacturer should therefore be in close communication, and this not only in the distinct line of cross breeding, but as well in originating and carrying into execution the union of breeds, or individuals of the breeds chosen as the instruments of the breeder.

In the illustrations we have first the two elements of the new Hampshire, the old Hampshire and the Southdown, making an improved breed both for wool and mutton; a solid carcass, with the size of the one and the fineness of wool of the other. Then we have the new Hampshire and the Cotswold, a new and an old breed, united to make the Oxford having a coarser wool than the ewe, but a finer fiber than the ram, and in these changes it is as easy to trace the different bloods as if colors had been mingled.

At fig. 15 we see the effect of the prepotent Southdown blood in refining this wool, giving its cup-form scale, upon which its softness, pliability, elasticity and less aptitude to felt in manufacturing depends. By careful comparison we may trace the infusion of the Southdown influence in the improved sheep, which was, however, bred not for wool but for mutton, and yet the wool we may see has been made more valuable than that of the old race. It was also double in weight of fleece by the larger carcass of the improved animal. And the fiber has been just so much changed as to be adapted to a wider class of woolen goods than that of the Southdown.

Then we study fig. 16, the Oxford Down, a large sheep of the Cotswold type, but as we see modified as to the fleece by the influence of the Hampshire (the Southdown indirectly) and the old Lincoln through the Leicester. The result of these crosses has been to make of the rougher worsted Cotswold, a softer, finer fiber, suited for the finer woolens used for man's softer clothing, shawls and knitted underwear, for which the long, less adherent Cotswold fleece is not fitted.

Then we go on to the new Leicester, bred from the mammoth coarse-wooled Lincoln. Fig. 17 shows the character of this wool, which measured 14 to 16 inches in length, and had so little tendency to the felting quality as to be made into the loosest kinds of fabrics, such as fringes, braids and bindings. This monstrous sheep was out of date 100 years ago, when Mr. Bakewell had progressed somewhat in building up his favorite sheep, known at that time as the Bakewell, but afterwards as the improved Leicester, and considered as the very acme of skillful breeding. This successful breeder told few of his secrets, but it is known that he started with the Lincoln and used the Southdown as the sire, to remodel the coarse ewe into a smooth, silky-fleeced sheep that should make the finest mutton in the world; a quick feeder, having a good, smooth carcass, much fat, and as it happened as the result of this special character of the animal, a producer of fine, soft, silky wool, of which the best fabrics could be manufactured. It should be noticed that every improvement in the carcass and in aptitude for feeding and for early maturity told equally on the wool, and by study of the Leicester fiber (fig. 18) we see the result—a wool almost of the Merino character, but 8 or 10 inches long, suitable for the fleeciest fabrics, as the soft nubias, and especially dear to the patriotic heart, as the material

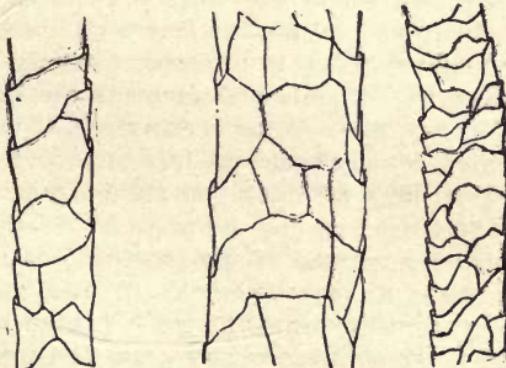


FIG. 18.—Leicester. FIG. 17.—Lincoln. FIG. 19.—Shropshire.

of the emblem of freedom that waves over the American capitol. This wool is the material of which the dress bunting are made and the soft head dresses of the farmer's wives and daughters, when they make their evening visits.

It is wholly of the Merino class, except for its length and want of curl, and makes a most excellent cross with the Merino.

We pass on to the most useful cross-bred sheep we have, the Shropshire, and there we find perhaps the most remarkable of all the results of cross-breeding upon the fleece. This sheep has been little thought of as a wool-bearer, but to the wool student it has a special fitness as an example of what has been done by crossing, for future use in this direction. Fig. 19 shows a wool that is unmistakably made up of the Southdown, fig. 20, Leicester, fig. 18, and Cotswold, fig. 21. The mingled features of these three fibers are as plain to be seen as the three primary colors in the rainbow. The cupped form of the Leicester, modified by the closer imbrication of the Southdown, and the more uneven outline of the Cotswold, are all plainly to be found in this drawing; and the wool of this most popular sheep, next to the Merino, finds its place in the manufactory in special uses for which the sorter puts it on one side.

All these specimens are of the coarser clothing wools. They enable the manufacturer greatly to extend his classes of goods and find variety to please the wearer. That this opening for variety is filled, we cannot believe. In fact we must believe the very contrary, for if there is any one thing the world is pining for at this time, it is variety in every way. And thus the wool grower may well exercise his ingenuity, or tempt fortune, in attempts to strike something new that may be valuable and increase the demand for wools of all kinds. The opening is enormous. Twenty years ago we boasted of an annual product of nearly 70 million pounds of wool; now we think 300 million pounds a small affair, to be increased as may be possible. In this vast increase, we have surpassed all prognostications of experts. How much more we may progress in the future, who can tell? We are using nearly as much foreign wool as we produce, and much of this we may grow at home. But we may look for changes such as have occurred in late years in the greater use for long Merino wool, and we cannot doubt there are many special qualities that will come into extensive use as soon as they appear on the sheep's back. And this must grow out of crossing the breeds we have rather

than out of new breeds. We have abundant material for this work, and in it the Merino, I feel convinced, will take the first place.

As an instance of the result of special necessities in the production of wool I would recall a passage in a most able and exhaustive address made by Dr. Hayes, the President of the National Association of Wool Manufacturers a few years ago, in which he mentioned the fact, that the great popularity of the Cotswold sheep during the years of the civil war, grew out of the requirements of the trade for a coarse wool for the manufacture of warlike materials, such as buntins, saddle-girths, epaulets, trimmings, coarse blankets and overcoats. When the war ended this demand ceased, and the Cotswold suddenly became as unpopular as it had been otherwise before. Now, said Dr. Hayes, the demand is for a finer combing wool, as that of the Leicester, which furnishes the material for a large variety of dress goods, and is so highly valued for its silkiness, fineness, and lustre. This kind of wool is mostly imported from England, for the reason principally that American farmers will not take the pains to grow the roots which this class of sheep—or any other for that matter—must have to produce the best wool. This fresh, succulent food is indispensable for the best condition of sheep during the long, dry feeding season of winter, and until our wool-growers will adopt this manner of feeding we cannot hope to do the best we may, in the production of the best wools, and especially of those lustrous combing wools of long, fine staple, such as that of the Leicester, the French Merino, and the crosses of these which have been found so desirable in France for the manufacture of the excellent dress goods which we pay so highly for.

In this production, the Merino, and especially the Ram-bouillet variety, must hold the most important place. It seems probable that this long-wool, large-bodied sheep, is to take the first place as a wool producer, and that the short-wool sheep must follow the yet shorter Silesia into comparative insignificance, for the reason that the fashion of clothing has changed of late years, as it did fifty years ago, when the fine nap broad-cloths went out of demand, and the more varied napless cloth came into use. And as there is still

some demand for even the finest and shortest wool, so there will be for the medium Merino fleece. But it is clear that the tendency is to the use of longer wools and somewhat coarser fiber. This will be supplied by the Rambouillet Merino, with its crosses and varieties known by various names: Me-



FIG. 20.
Southdown.



FIG. 21.
Cotswold.

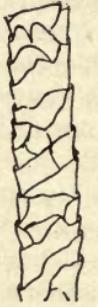


FIG. 22.
Ram-Merino-Ewe.

rino, fig. 22; Cotswold, fig. 21; Southdown, fig. 20; Shropshire, fig. 19; and Leicester, fig. 18; and those of our common American Merino, which has hitherto been of such enormous value to American breeders. The illustrations here given will go to show how great a variety of wools may be produced in this way, and that with the natural increase in the consumption and demand for various kinds of wools, the Merino will not find its occupation gone, but



FIG. 23.
½ Merino and Southdown.



FIG. 24.
¾ Merino. ¼ Southdown.

greatly increased, as the progenitor of rams for cross-breeding, and in addition to its own special use as a wool-bearer, for the supply of numerous fabrics that will never go out of fashion.

In all these samples we may perceive the effect of the

strong blood, and in some the result of both sides, as if there were a struggle for the preponderance. The five drawings are of the parents of the crosses which follow. When we study these cross-bred wools we are impressed by the fact that the first two crosses vary considerably, showing the influence of both parents, and as these are both of the strongest blood, the two oldest breeds in existence, this is not an unexpected result. But in the third cross the two most un-



FIG. 25.

Fig. 25, $\frac{1}{2}$ Merino and Southdown.

Fig. 26, 15-16 Merino and Southdown

Fig. 27, $\frac{1}{2}$ Merino, $\frac{1}{2}$ Shropshire, and $\frac{1}{2}$ Southdown.Fig. 28, $\frac{1}{4}$ Merino and Leicester.Fig. 29, $\frac{1}{4}$ Merino and $\frac{1}{4}$ Leicester.

the late Joseph Harris and given to the writer by him. This sample shows how two strong natural tendencies are combined in almost equal proportions, as may be easily perceived by comparing figs. 21 and 22 together. The fiber of wool of this cross was seven inches long, when stretched, had considerable crimp, the yolkiness of the ewe, and none of the looseness of the ram's fleece. To my mind this was the most successful cross for wool that I have seen, as it was a most satisfactory cross for market lambs to the breeder.

This is a subject for much consideration and experiment. It is suggested in this line. The evidence goes to show that there is a wide field for enterprise and careful study in this cross-breeding. And if sheep-breeders can succeed in producing a flock that will yield any more desirable fleece than we now have for any special purpose, and at the same time yield good mutton by the use of the large-bodied Merino on any of our other breeds, and especially upon the native sheep, now the least profitable of all kinds, much good will be done to all concerned. I offer no further suggestion to intelligent readers, but simply present the evidence which I have gathered."

THE CULTURE OF WOOL.

"The wool grower," is a very fit term to apply to the shepherd. The wool is indeed grown, and this only by quite as much skill and attention to every detail and necessity as the ordinary farmer applies to the growth of his crops. For these must be fed, or they fail to produce the quantity or quality of the desired product; so the wool grower must feed his flocks for this very same purpose—the crop of wool which he gathers from his sheep annually. Wool, we know, is an outgrowth of the skin, produced by the proper aliment by which the flesh and its coverings, the skin and its fleece, are nourished. All through the history of the sheep we find that the feeding and general culture of the animal have been the means by which the ends desired and worked for, have been attained and secured, and made a permanent acquisition of the sheep thus improved. We are too often told that it is breeding which has produced these improvements in the domestic animals. If this is true, then we have gained something from nothing,

for as we have seen in a previous chapter, it is a natural law that "like should produce like," and at the best we cannot gain anything more than the mere likeness of the original animals we are breeding, and we shall do well if we gain only this, and nothing more.

This palpable fallacy is mischievous and misleading; and tends, not to the advancement of any object in view, but the distinct contrary. In all the instances which have been given in the preceding pages, we have seen that every improved breed has been made through the selection of the best animals to be procured, and that the methods by which these have been made superior to the common stock, even of the same breed, has been by the most generous and skillful culture. So that we may fully accept the fundamental law laid down for use by all the scientific breeders and philosophical students in this line, and make it the rule for the management of our flocks for the purpose of getting the full profit from them, that the feeding must be a special accompaniment to the breeding and an indispensable part of the culture of improved animals.

Experience all through the history of the sheep goes to show, that to sustain excellence in them the feeding must be fully maintained. The English breeders from whom we have procured our best animals have had a certain system through which they gained the high position held by their flocks, and if this is so, as cannot be gainsaid, we must follow in their steps, if we would hold our own, not to say make any advance on their high position.

It is alleged that the English shepherds depend mostly on the mutton for their profit, and that the wool is a mere incident in their business, and not any serious object of pursuit. We must not be misled by this fallacy which is contradicted by all the past history of English agriculture, and the main part of it as is accepted by all concerned. For the sheep has been, and still is, considered as the very basis of successful agriculture in Great Britain, and indeed in every leading agricultural nation of Europe. The very foundation of the successful agriculture on the high priced lands of Europe is the feeding of sheep, just as it was alleged to be in ancient times. It is true the mutton is an important incident in the shepherd's pursuit, but this is the growth of flesh. And it

happens that in making this high condition of the sheep the fleece cannot help but take its share of it. We all know that a poor sheep yields poor wool, inferior in quantity and in quality as well. The condition of the fleece is a certain key to the condition of the bearer of it. We have seen that the flesh and the fleece consist both of the very same elements, and the oil and yolk of the wool, which are a certain indication of quality of it, are equally supplied through the very same aliment by which the body of the sheep is supported. We cannot divert the aliment of any one part of an animal from one product of it, and make it wholly contributory to another, and a different one. Nature has its laws which are inviolable, and cannot be transgressed without disaster. So that we may be sure we cannot feed a flock to make an excellent and fully healthy carcass, without gaining similar results in every part of it, the covering of it as well as the body itself.

Again. Every fact in the experience of feeders of sheep goes to show that any failure in the regular feeding of a sheep is marked by a weak spot in the fiber of the fleece. If the failure is serious the wool is so weak and inelastic that it breaks in the mere handling, and with the slightest tension. Let us refer back to the illustration of this fact given at figure 6, in which is seen very distinctly the effects of a fault in feeding, and in the nutrition of the sheep from which the sample of wool was taken. It is a rule in the alimentation of all animals, that the most important parts and functions are first provided for by the disposal of the nutriment, and the remainder goes to the support of the least necessary parts. So that every other part of the sheep must be supplied in excess of its wants before the least necessary parts are supplied. Then it must follow, that unless there is a surplus of proper aliment after the mere body has been fully supplied, the fleece will be the first to suffer. Consequently the feeding of the sheep for the growth of the fleece is to be made as much of in the management of a flock as for the support of the life itself. Generosity in this regard is a paramount necessity for the product of good wool.

We have said that the English feeders excel in regard to the mutton of their sheep. Their way of feeding is especially adapted to this end. Their mutton is fat and the fat

is now not so much laid on the carcass just under the skin as it used to be, when the four-year-old wether was the prime market sheep. Now it goes to market at half the age, and really before it is fully grown. This naturally changes the old style of mutton sheep which had two inches of fat on the outside of the carcass. As the animal was then fully grown and was not making flesh, the fat could only be disposed of in this way. But the scarcely maturely grown wether of the present fashion is made up of quickly grown flesh, in which the fat is intimately intermingled all through. And this is made by the same process of feeding from the birth of the lamb as was formerly applied to the full grown animal only. So that it cannot be otherwise than that the fat in the animals is evenly distributed all through the young flesh, weighing half as much as the former aged one.

The result of such generous feeding from birth cannot be doubted. The body is fully supplied, and there is a surplus of nutriment which goes—where? Necessarily to the fleece. And thus, whether the English feeder of sheep intends it or not, he is a wool grower quite as much as the shepherds in Argentina or Australia or Africa who shear their sheep as long as there is wool enough to pay, and then boil down the carcass of the old sheep for the tallow.

And just as wrong feeding tends to disease of the sheep, so it is productive of disease in the fleece. Why it should not be put in this plain and simple way there is no reason, for if the animal may be diseased in any part of it, in the skin even, why not attach this same distinction to the wool? It puts the matter in a more forcible position to the wool grower possibly, and will give him a better idea of the imperative necessity for avoiding all errors of management by which the wool is injured. And the first of these is insufficient feeding; the next is undue exposure to sudden changes of weather. It is not so much the kind of weather the sheep are exposed to as frequent and serious changes, without any reasonable shelter. The sheep is easily suited in every way, but while it may be thought its fleece is a protection against changes, it is quite otherwise in fact. It is a protection against cold, if this is continued, but sudden changes from warm to severely cold weather are as seriously felt as if the sheep had only its bare skin. It is so in

all concerning this easily susceptible animal. Any kind of steady, unchanging conditions it will withstand, but changes are as trying to a sheep as to a person who is wrapped in a heavy overcoat every day in the year.

The most common disease in wool is that commonly called break. It cannot be perceived by the naked eye, but is very easily discovered by stretching a small lock of wool. Then any weak spot in it breaks, and this if examined under a microscope shows this kind of defect (fig. 32) in the fiber. This sample was taken from the fleece of a sheep which had died through exposure and starvation, on the range, and the severity of its sufferings may be understood by comparing a fiber from a sheep well cared for through the same Winter

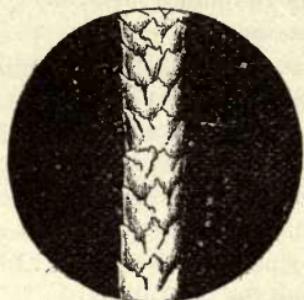


FIG. 31.
Healthy fiber of wool.

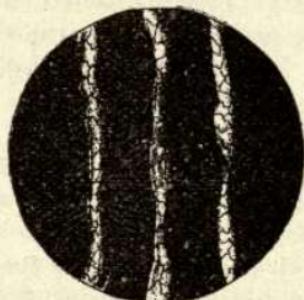


FIG. 32.
Break in wool—A diseased fiber

in the same locality with it (fig. 31). These samples were taken from the common native sheep which have a small infusion of Southdown blood in them, somewhat far back, but still show it in their occasional smutty faces and legs.

This defect is equivalent to a diary, or nearly so, of the sheep's condition. When the first failing occurs the weak spot is of course at the skin, but as the fleece grows this weak spot is carried up, and although the fault may not happen again this evidence of it remains in the wool. If it is repeated, the same failing is marked on the record, and so on, until the sheep is shorn, when the fleece is worthless if it is badly defective, and lessened in value proportionately with the amount of defect in it. It is really the most common defect in wool.

Another disease is that commonly known as stripy wool. This affects the fleece in the most valuable part of it,

that is on the side near the shoulder. This kind of wool is without elasticity, harsh, and without the curl or wavy fiber of the best wool. It is most distinct in the Merino and the curly long wools, as that of the Lincoln. Such wool is dead and lifeless, without elasticity, and may be pressed by the hand into a ball, as so much cotton fiber might. Of course its value to the manufacturer is depreciated, for it can only be used in inferior goods, as to mix with shoddy, to hold the stuff together.

Another defect is known as topiness, which is a sort of felting of the fibers at the top of the fleece, by which it causes waste in the carding. This is a result of uneven growth due to a continued period of good feeding or condition of health, followed as it might be by hardship in the Winter, on exposed ranges for instance, or by want of shelter in the smaller farm flocks. In the lamb it may be only a temporary condition, but in an old sheep it is a drawback to its use as a lamb bearer, for this, as all other defects in the fleece, are inheritable. It is one of the points to be thought of when stock is selected for breeding.

Felted wool is a decided disease, arising from a constitutional or a temporary impairment of constitution. The wool is naturally weak and devoid of sufficient yolk to lubricate it, so that it does not move smoothly but chafes in the motions of the animal. Then when wet weather happens, and the wool becomes wet to the skin the fibers adhere, and in time becomes matted together in bunches, causing a serious loss in the combing or carding of it. This fault is most common in the rather harsher wools of the Downs varieties, under such inferior conditions as do not provide sufficient nutriment to sustain the best growth of the fleece. When this felting is less apparent and occurs only at the bottom next the skin as the results of damage later in the growing season, or to inherited tendency to the fault, it is known as clouding, and appears as a flossy condition of the fleece near the skin. This is easily removed when it exists in long wool, that is combed, because the combing removes this soft fiber, but it causes waste and a loss even in this way. In short wools it is not so objectionable as the carding mixes it with the other wool, and it has no unfavorable effect in the succeeding processes. But in examining animals for

breeding this defect is one to be considered as objectionable, and considerably reducing the value. In every addition to the flock, of a father for the lambs, the highest excellence only should be the main consideration. For as these defects are constitutional one knows not what others may be hidden in the animal to appear in time in his progeny.

Broad topped wool is that kind which splits at the top and down some way into the fiber. The surface of the fleece may appear all right, but when the wool is parted it is found that the fibers are adhering together some way down, thus dividing the fleece into masses which cannot be parted without tearing the wool apart with some force. This matted fiber is dead wool, and is a total loss in the manufacture of the finest goods. This is an inherited defect, and to be considered in the choice of a breeding animal whether ram or ewe. It may be pardoned to some extent in the ewe, for obvious reasons, when extra good quality otherwise causes this to be overlooked; but it is unpardonable in a ram because the fault may effect the whole produce of the flock.

A kempy sheep should be discarded on sight. This disease is entirely constitutional. In breeding stock it is a fatal objection. Wherever it exists it is to be found all over the sheep. It is a residue of the old lineage from the wild animal, and that it is still existing goes to show the force of the inheritable tendency to go back to a distant ancestor. In this case it means some thousands of years, since which it has been continuing in the blood. It is recognized by the short, coarse hairs mostly found on those parts of the sheep where the wool is the lightest, and the shortest; as on the face, upper part of the legs, inside the flank, and on the scrotum. When any sheep is found to be thus affected, the same hairs may be found on examination all through the fleece, and as these harsh hairs do not take the dye as the wool does, this kemp is a serious objection to the manufacturer of any kind of fine goods. This of course reduces the value of such wool and the bearers of it. It thus lessens the value of the fleece one-half, and it is not possible for the wool sorter to separate it from the actual wool. It is sometimes found in the wrinkles of the very heavily fleeced Merinos, and may thus be sorted out at the expenditure of a little extra labor and waste of wool, but it should be the ob-

ject of every advanced breeder to exterminate this worthless part of the fleece, by selecting out as much as possible all the kempy sheep from his flock. There is no reason why this should not and may not be done. Breeders have covered the Merino, and indeed other breeds of sheep, over with good wool down to the hoofs, and other breeds have been improved in a similar way, thus adding very much to the product of a flock. It needs only the efforts of all concerned, and possibly such suggestions as this to the advanced breeders, to rid all kinds of sheep of every defect, and as far as each may in his allotted time, do everything in his power to leave the world in this respect somewhat better than he found it. No one has any use for kemp, and it should be obliterated from every flock, just as we may say of the horns, which to a large extent have been got rid of except in the Merino, and why not in this breed, which might doubtless be brought to put the matter thus wasted, and which is precisely the same matter as that of wool, into the fleece? This remark also applies to certain other diseases of the fleece, indirectly, and directly diseases of the skin, through which the wool is affected; such as scab, the most costly of all this class of diseases, with other parasites, by which the shepherd is troubled, and which might easily be eradicated by the destruction of these creatures in a sure and certain way, as has been shown by the effective measures taken in Australia for the destruction of the scab mite. This result, although not yet completely effective, has been so far attained as to prove the possibility of this end in the course of a short time, when all concerned shall have adopted the measures by which a large number of flocks have been completely freed from the disease. There are several diseases of this class due to the action of parasites, chiefly vegetable, and varieties of fungi of a low order, which directly attack the wool and feeding upon the fibers cause these to split and become entangled in a mass. These diseases also affect hair in a similar manner. In general it may be said that these and in fact every disease of the skin, and some constitutional disorders, are in effect diseases of the fleece, but these will be noticed fully in the last chapter, which is devoted to diseases of the sheep particularly.

UNIFORMITY IN WOOL.

A serious defect in wool may not be strictly a disease, but it may be a result of a poor condition of the sheep due to some mistake or neglect in the management. The best and finest wool is found on the shoulders, and this is made the standard of the whole quality of the fleece. If, as compared with this, the wool on the sides, thigh, rump, and breech, approaches it in quality, the better the fleece will be all through. An equality in fineness of these parts of the fleece makes the fleece even as to the fineness of the wool. A general regularity of length of wool on these parts of the body, makes the fleece even in this respect of length of staple. The density of the fleece is tested by closing the hand upon the wool of a part of the loin, and on the rump, and if it is found that the fleece is as thick and close on these parts as on the other portions of the sheep, the density of the wool is even. The perfect fleece is nearly equal in fineness of staple from the shoulder to the thigh; and if the wool is nearly equal in length at the shoulder, the ribs, thigh, and on the back, the density is equal on the shoulder and across the loins, and there are no defects, due to the diseases above mentioned, the wool is uniform. A perfect fleece is really a certificate of perfect health in the sheep and of the good management of the flock by the shepherd. The even growth and quality go to prove the evenness and regularity of the general management and the concurrent thriftiness of the flock.

WASHING SHEEP.

Wool necessarily becomes charged with many impurities during the season of its growth. Dust adheres to it by reason of the oiliness and viscous nature of the yolk. The secretions of the skin gather in it, as well as the filth of the sheep. There is an excessive perspiration exuding from the skin, more or less as the season excites it. All these foreign matters add much to the weight of the fleece, and reduce its general value to the buyer, who usually deducts one-third from the current prices as compensation for these impurities. As a rule some variations occur in this regard by reason of the quantity of impurities existing in the wool. This is due to the manner in which the sheep have been kept, the kind of

pasture on which they have fed, and other obvious circumstances. So that any undeviating rule for this deduction must be a manifest injustice to the owner of the flock. There may be a full half difference in this respect in the fleeces of different flocks. So that the custom of brook-washing, as it is commonly termed, is resorted to for the purpose of cleansing the fleeces from the greater part of these impurities. This semi-barbarous process is not only far from effective, but it is seriously hazardous to the health of both the shepherd and his sheep. Unless the water is pure, and the bed of the stream is free from mud or sand, the wool comes from the operation at times more heavily charged with impurity than before it was washed. On the whole this process is justly becoming obsolete, and if the wool is to be washed on the sheep's back the operation should be performed under the most convenient and effective arrangements.

Such an arrangement consists of a suitable enclosure for the sheep on a green clean sward, and in which a catch pen as described on page 214 is arranged. A suitable boiler is used by which the water may be kept at an average heat of eighty degrees, in the washing tank. This is reached by a sloping platform, enclosed at the sides, along which the sheep is led by an assistant. As soon as one is washed in the tank at the end of this platform it is discharged through a passage way into a clean, grassy plot, and the next one is taken in hand. As it is required the water in the tank is renewed, and it is an excellent way to help the washing to clip off the most filthy tag locks behind the sheep and have these washed separately after the sheep have been finished.

No soap is required in this process, the yolk of the wool being a natural soap. It consists of a little less than one-half water, and more than one-half fatty matter akin to a common potash soap. The potash in the yolk is so abundant that in large establishments it is recovered from the waste water and sold. Besides the soapy yolk there is about eight to ten per cent of oil in the fleece, but this is not generally removed by the washing, some being left in the wool. It is not desirable to carry the washing so far as to rid the fleece of its oil; the result of this is to make the fiber harsh to the hand, and to that extent render it unsatisfactory to the

buyer. This, however, is avoided by adding a moderate quantity of some non-drying oil to the fleece the day after the washing is done, thus restoring the softness and elasticity to the fiber. If two weeks are permitted to elapse before the shearing, and the sheep are kept in a dry, clean grass field, the wool will have regained its natural softness.

It is a question among experts whether excess of yolk is a desirable quality of a fleece. The old authorities in this regard favored the largest quantity of yolk. The leading old writer on sheep, Mr. Youatt, was of the belief that no amount of yolk might be thought excessive. But the old beliefs have generally been discarded in the majority of instances, in all kinds of scientific matters, for the reason that these things were only very partially understood half a century ago, and we have a far better knowledge of the reasons for things now than were then possible. Mr. Randall, one of the highest early authors on sheep, thought—as most of his successors do to-day—that excessive yolk was a waste of material for no use, and the matter of it might be more economically disposed of some other way. As nothing comes from nothing, we may be sure that the shepherd must pay in some way for the yolk in the wool, just the same as the wool itself costs an equivalent of money spent in feed, of which it is a product. But yolk is an absolute necessity for the well growing of the fleece, and an abundant supply of it is a great safeguard against some of the diseases of wool above described. But this matter may be left to work itself out as every other of the same sort is doing, and will do, by the good sense of the intelligent leaders of this great interest.

SHEEP DIPS AND DIPPING SHEEP.

One of the most important parts of the management of sheep, next to the feeding, is the occasional dipping of the flock. This is essentially a process of cleansing the skin, and avoiding the diseases of it, and the fleece together, that may be reached in this way. This process is essential to the welfare of every flock. Generally it is gone through once a year. But experience and a considerable reduction in the cost of the process, have tended to encourage the practice of dipping twice and even three times in the year. Twice in the year is really indispensable for the health and comfort

of the flock, consequent upon the improved condition of the skin, the removal of the injurious and tormenting parasites, and the resulting improved growth of the fleece. In general, this process is thought to be merely necessary for the cure or escape from that pestilent disease, the scab; but really this is only one incident in the question as to how many times in the year we ought to dip the sheep.

Upon reflection, as to the nature of wool, and its complete relationship to the skin, we may well be assured that whatever conduces to a healthful condition of the skin is equally conducive to the welfare of the fleece, and the general experience of those large sheep owners who have practiced a biennial dipping of their flocks, goes to prove beyond question that it has more than paid the whole cost in the increased yield of the fleece, as well as the improved condition of it, by which its market value has been increased sufficiently to return every dollar expended in the process, besides insuring such comfort to the flock as has greatly aided in their feeding for market; in the ability of the ewes to bear and feed better lambs; in the growth of the lambs; and in the important saving in labor consequent upon this betterment of the flocks. The comfort of mind of the shepherd is also something to be thought of in this connection; for when the flock is known to be free from all the discomforts and diseases incident to a diseased skin, and the persecution by bloodthirsty parasites, the shepherd may be happy by day and by night, and enjoy the sweet sleep which is the perquisite of the just and industrious and thoughtful and successful man.

There are a great many kinds of dips, and of all that we are acquainted with, there is only one which is not useful and effective for the purpose, and what is of the greatest importance safe for the sheep, and fatal to the parasite for the destruction of which the dipping is practiced. But more than this, every one of these dips are really antiseptics; that is, while they destroy injurious parasites—the scab-mite, the bloodthirsty tick, the lice and the fungoid parasites of the wool, as well as of the skin—they cleanse the skin from the accumulated gathering of its secretions; they open the pores to a healthful function; and thus free the sheep's system from the dangerous probability of the absorption of

unwholesome matter in the blood, by which diseases of various kinds are sure to happen, and which give vast trouble and anxiety to the shepherd, as well as inflict upon him heavy losses. It is always best and cheapest to avoid troubles of any and every kind, and this process of dipping the sheep tends to avoid many difficulties, some unthought of by the owner of a flock.

The one reserved dip above suggested is that sulphur and lime mixture which has been so highly extolled and recommended by some of the amateur shepherds, whose field of labor is at Washington, the seat of our paternal and watchful Government. This dip is one of the most injurious that could have been suggested or invented. It will doubtless kill the seab insect and the ticks, too, and most effectively, for it will destroy the fleece and the sheep as well, and it is a plain fact that where there are no sheep and no fleeces there will be no parasites to annoy the shepherd. And this will be the inevitable result of the use of this most offensive and acrid stuff.

Lime, we all know, is used by the wool pullers to loosen the fiber from the sheep skins. It is one of the most effective depilatories, and must be used with the utmost caution. By its combination with sulphur it does not lose this destructive action on the skin, and when used for a dip for sheep this excessive caution is something impossible, except for some professional veterinary to exercise during the use of the dangerous stuff. Even then, were it the only thing in existence for this use it would be open to the most serious objections and would in many instances destroy flocks to which it might be applied without due caution.

The objections to this wholly injurious and unsafe dip are increased in force by the fact that there are many excellent preparations for dipping sheep that are safe, effective, and cheap; even better in all these respects than any home made dip; such as that of tobacco and sulphur. And these are obtainable on demand always of the same strength and effectiveness, and most easily applied to their special uses. We may mention just here, that for use when accidental infection of the flock by ticks may happen, that the use of sour buttermilk poured along the back and led down the sides of the sheep by skillful use of the hands will rid the

sheep or the lambs of the pests. This devise may be useful in case the regular dipping may not have had its complete desired effect, or the sheep may have picked up a fresh stock of the ticks in any way.

A word should be said as to the arsenical dips. These are very effective in use, and safe, except as to one circumstance, which is possible danger to the lambs if they are permitted to join the ewes until the wool has completely drained off. The same may be said in regard to the tobacco dip.

This, however, is given only as a hint to the owners of small flocks; it cannot take the place of the regular dipping apparatus, or the regular dipping preparations in the market. It may also be of interest to all concerned in regard to the lime and sulphur, or sulphide of lime, to mention the fact that the actual experience of a well known wool scouring establishment, in which some wool from sheep dipped in this highly caustic mixture was scoured, and after the finishing was found to be so much injured as to bring less money than the wool of sheep dipped with the other preparations in the market. This is to be expected from the known character of this caustic compound. For whatever will destroy the skin, must have a similar result on the fiber, which grows from the skin. This is no new remedy for scab, as it is called, either. It was recommended by a California chemist twenty or thirty years ago, and was mentioned in the U. S. Agricultural Report of 1876 as a cheap preparation. It is cheap certainly, as to its cost, but experience in California goes to show that in practice it was a very dear thing.

Sheep are dipped in troughs arranged in many ways, as the fancy or convenience of those concerned may dictate. For a small flock a trough twelve feet long, eight inches wide at the bottom, and thirty inches at the top, with a sufficient depth to cover the sheep except its head, which is held up as it is passed through the trough, the body being submerged sufficiently to enable the assistants to thoroughly wash the animal and reach every part of the skin. The dipping liquid is kept at a temperature of something over a hundred degrees, up to a hundred and ten or twelve, by frequent additions of hot liquid from a heater adjacent to the dipping trough. It is diluted to the right degree in strict accordance

with the directions given by the makers of whatever dip is used. These directions should be followed strictly, as they are based on accurate experiments and long practical experience.

After having passed through the dipping liquid the sheep are kept in a pen adjacent to it and having a tight floor sloping back to the dipping trough, into which the excess of the dipping liquid drains. After sufficient draining, the sheep are let into a lot where the fleece may dry. But ewes with lambs are to be kept apart from the lambs until the fleece is completely drained.

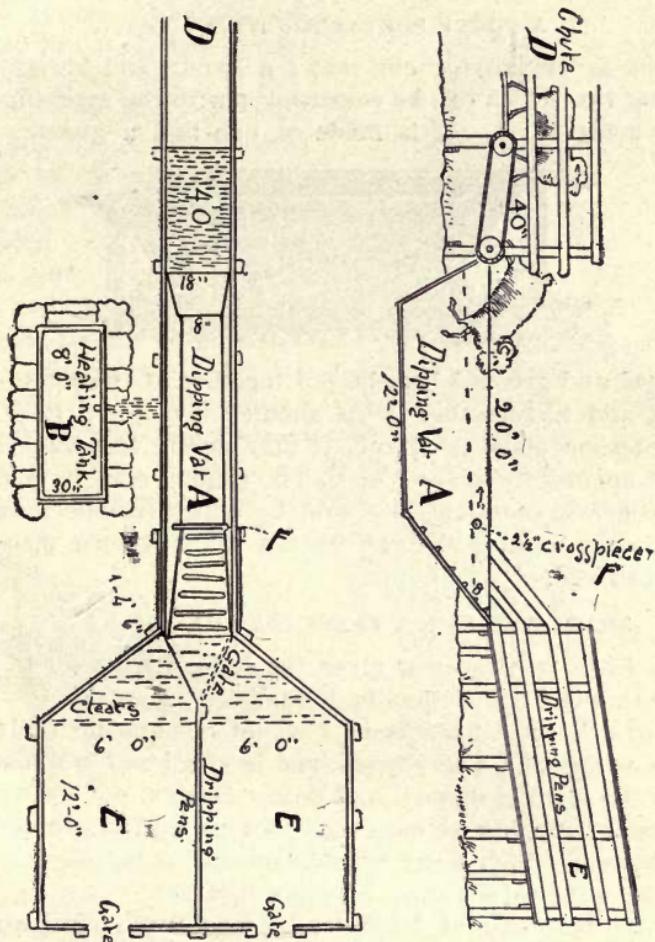
It is no harm if some struggling sheep should take some of the dip into its nostrils. Indeed some of it may reach the hiding places of the annoying bot-fly, and in the violent sneezing of the sheep from the effects of the dip, these pests may be ejected to the great relief of the sheep. That the sheep in this process may be subject to such accidents as this is a good reason why injuriously caustic preparations, as the exceedingly corrosive sulphur and lime mixture, should be avoided. The regular dips in the market are all, not only effective as a sanitary wash for the skin, but used after the shearing they are healing in their effects on any cuts that may be made in the shearing. Immediately after the shearing is a good time for the dipping. There is no waste of the dipping liquid, and the process is very much simplified and eased as compared with the dipping previous to the shearing. It is an indispensable precaution to be taken, not for the cure of the scab disease only, but for its prevention; and every reasonable flock owner—we think—would favor a national law by Congress making dipping obligatory as not only a cure for diseased sheep, but as an effective means of totally eradicating this pestilence.

SWIMMING DIP TANK.

The following plan is used with success:

The swimming tank should be from fourteen to fifty feet long and five feet deep, eighteen inches wide at the top and not over six inches wide at the bottom. The tank should be made of two inch tongued and grooved boards, closely fitted together so as to avoid leakage. At one end the tank should be tapped with holes for heating coil. This coil

should be run to a stove or fire conveniently located, and constructed on the same principle as any ordinary kitchen hot-water boiler, and having at the same time, kettles close by in which hot liquid and hot water can be obtained for replenishing the dipping tank; or if you have no coil with stove, have kettles and heating apparatus sufficiently large



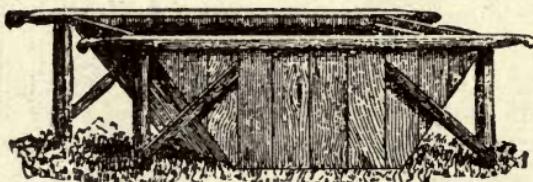
to keep the tank well supplied with hot liquid at the degree required, namely, one hundred to one hundred and twenty degrees, according to the kind of dip used.

At one end of the tank should be constructed a chute, just wide enough to admit one sheep at a time, say eighteen inches. On the other end draining pens should be arranged

large enough to hold about thirty sheep, so they can stand, and the surplus ooze drip off and be returned to the dipping vat. These draining pens will be found quite an economy when large flocks are handled. The end of the tank nearest the draining pens should have considerable slope, and cleats be nailed across for the sheep to walk up on.

A CHEAP PORTABLE DIPPING VAT.

The accompanying cut shows a handy and inexpensive dipping vat, which can be constructed with the appliances on most every farm. It is made of one and a quarter inch



tongued and grooved boards, put together at the joints with pitch, and is furnished with handles, by which it can be moved from place to place. It may be six feet long, three feet wide and three feet deep. The sloping ends have cleats nailed across them on the inside, by which the sheep are assisted to get out of the vat, upon a draining floor placed to receive them.

SMALL AND LARGE TANKS USED ON THE RANGE.

A Utah wool grower gives the following excellent plan for both hand and swimming tanks:

For a herd of 2,500 head I would recommend the small tanks as cheaper, easier made, and having less dip remaining after the herd is dipped, and easier cleaned out during the process of dipping as more or less mud will accumulate in the bottom which must be cleaned out every day or two.

The annexed diagram explains itself.

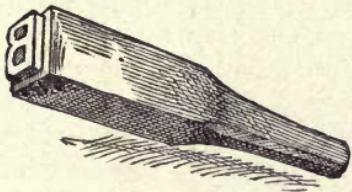
“A,” platform of boards nailed to 2x4 inch scantling which are laid on the ground.

“B,” dipping tank, 30 inches deep, 48 inches long, 24 inches top measurement, 10 inches on bottom.

“C,” sloping platform, which drains into tank “D.”

These are placed in the shearing pen, or in a pen contiguous (at the option of the shepherd), the sheep is grasped by

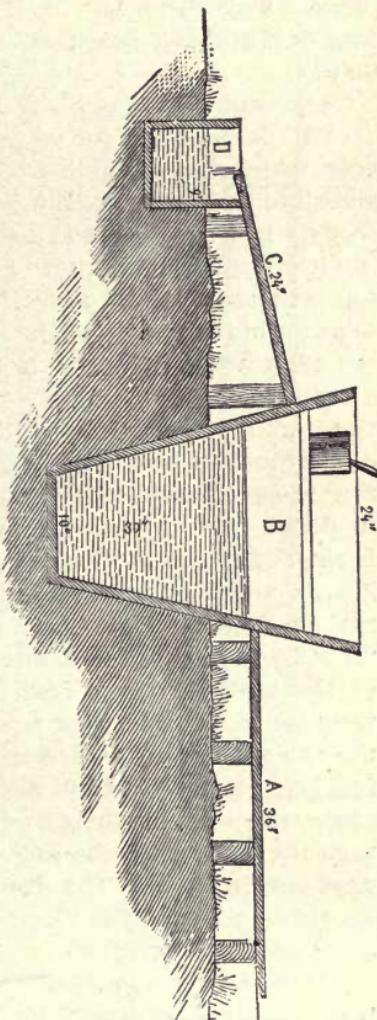
the hind leg, thrown on platform "A," one man grasps the hind legs, another the front, and the sheep is gently lifted into tank "B." (which is two-thirds full of dip) with his back down, and is held in that position for two minutes; he is then lifted on the platform "C." the excess of dip squeezed out by one hand, turned over and the other side served the same way, the dip running into the draining tank "D." The dip can from time to time be returned to tank "B." While in that position the sheep can be examined for age, feet trimmed if necessary, and branded by the paint pot in the end of the tank. And here let me impress upon sheep owners the necessity of branding as well as ear marking; it saves an endless amount of trouble and



BRAND FOR MARKING SHEEP.

ill feeling should your sheep mix with others, which is often the case. One man can brand 3,000 sheep when run into the shoot. Once tried

you will always continue the practice. With this tank four men can dip, mark and brand 500 sheep in ten or twelve hours, and at the same time prepare the dip and sack the wool, relieving each other at the tank; if more capacity is required another platform and tank can be placed so as to



also drain into tank "D." Some sheep men let go the sheep in the tank, when he will quickly turn himself, and if scabby some "special" (i. e. stronger) dip be applied.

I used these tanks for several years and was well pleased with them, but for larger herds an entirely different tank is required wherein sheep can be handled more expeditiously.

The tank here described is now universally in use:

"A" is the shoot for large corral; "B" is a sloping board over which the sheep in attempting to pass to decoy pen "C" slide into tank "D" which is generally twenty feet long, four feet six inches deep, and sixteen feet at the bottom, thus giving it a slope at the outlet of four feet, two feet wide at the top, and eight inches at bottom, thus compelling the sheep to swim in the middle of the tank. "E" is a board fastened in the tank with cleats on it to enable the sheep to obtain a foothold in walking out. "F F" are draining pens (water tight) and sloping to sluice box in center which carries the dip again into tank "D." "C" is a decoy pen containing a few sheep to entice the sheep into the shoot. "H" is a pen to dodge into any sheep not required to be dipped. "L" is the dodge gate. This tank can be made of one-inch pine boards, and lined with galvanized iron (No. 20 will do), which makes it water tight, and gives no footing to the sheep. "K K" are pieces of 2x6, twelve feet long, bolted lengthwise of the tank and four feet from each end, and six inches from top of tank, leaving a twelve inch space through which the sheep must put their heads, and preventing those in rear from riding those in front and thereby drowning them, at the same time keeping their backs under the dip. While in the tank the scab can be broken up, teeth looked at, and as they pass out, branded. The draining pens "F F" are regulated by a gate whereby the sheep escape from the draining floors, and can then be combed.

Many dispense with the sloping board "B" and use pen "H," particularly when the ewes are heavy with lamb the sheep are dropped carefully into the tank rump first. A boy is often placed behind sloping board "B" with a short stick to push the sheep in as they pass over it. One or two men stand at the tank to regulate the passage of the sheep, examine teeth, break scab, brand, etc.; 2,000 is a usual day's

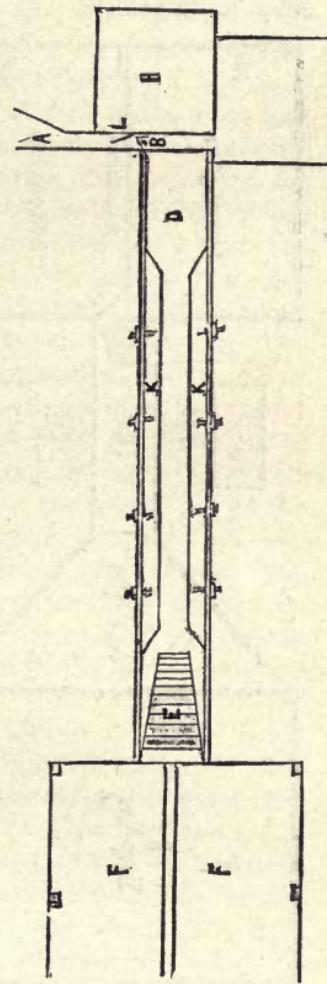
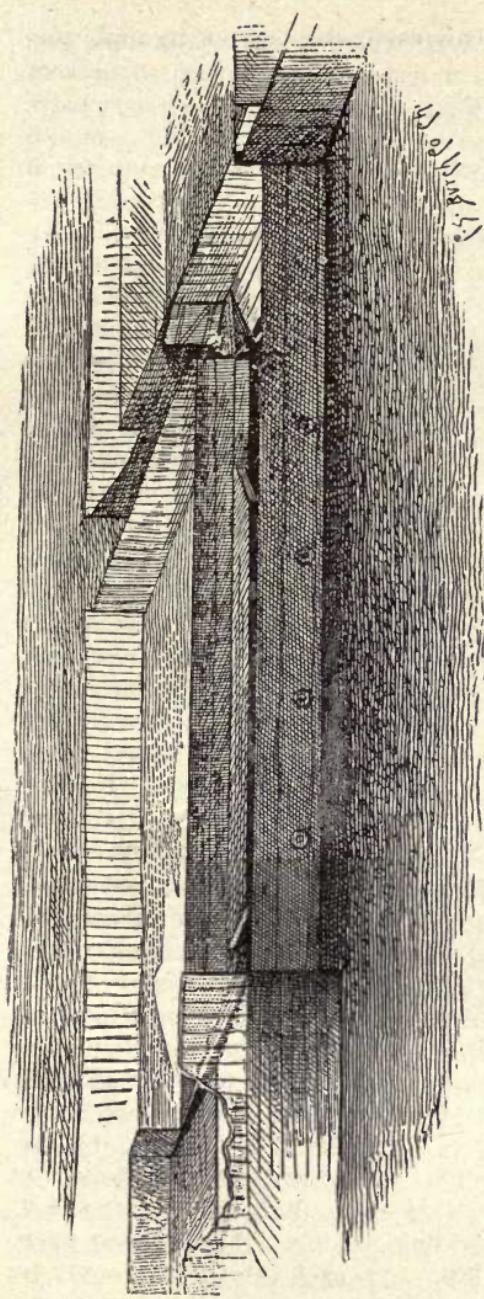
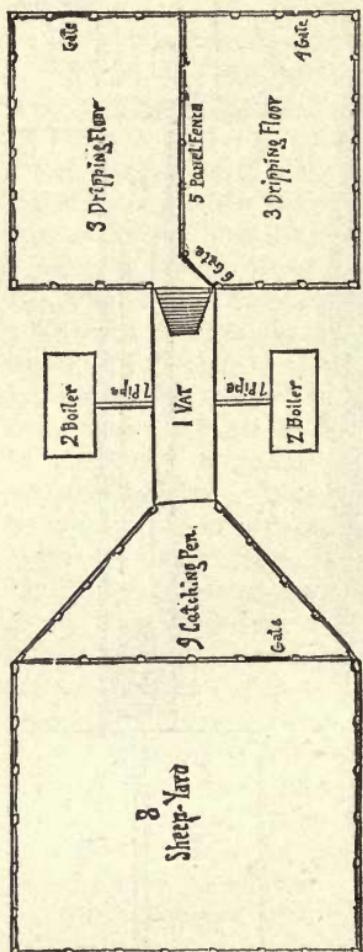


DIAGRAM AND PERSPECTIVE VIEW OF YARD AND TANK FOR DIPPING LARGE FLOCKS.

work and that number can easily be passed through this tank in ten hours.

A KANSAS SWIMMING TANK.

Our friend, David Fox, gives the following plan for a swimming tank:

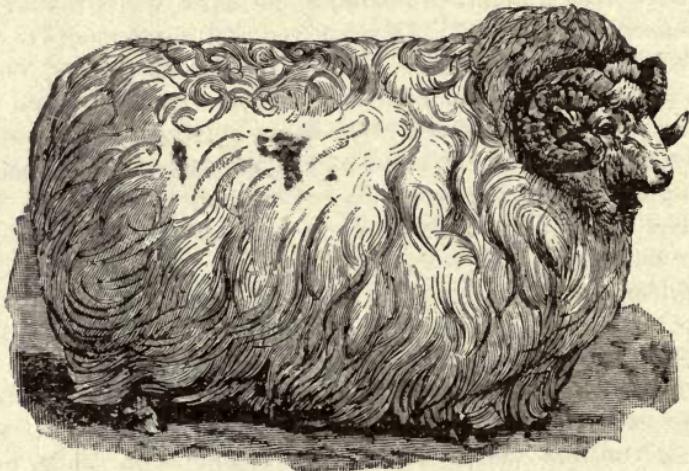


vat. There should be two cross bars across the vat, at equal distances, dividing it into three equal parts at the level of the dip. At each division should be a good trusty man. His duties I give below. The vat is set in the ground two feet and a half leaving

My working utensils consist of one dipping vat (fig. 1), two boilers (fig. 2 2), one dipping floor (fig. 3 3), divided into two departments, one sheep yard (fig. 8) with a small three-corner pen (fig. 9) next to the dipping vat, which is of great convenience for catching sheep; all of which are shown in diagram. The vat is made of two-inch clear lumber, well braced and bolted together so that it is perfectly water tight, sixteen feet long at top, twelve feet long at bottom, which gives four feet slope, with slats on the inside for the sheep to walk out of the vat into the dripping floor, six inches wide at the bottom on the inside, sixteen inches wide on top, four feet and a half in depth. Three and a half feet of dip is plenty to work with, but the vat should be deep enough to allow one foot above the dip to catch the splashing dip caused by the sheep struggling while in the

two feet above the ground. If the ground is conveniently located to lay an escape pipe to the bottom of the vat it would be a great convenience for cleaning out the vat after dipping. This apparatus requires to be located where water is plenty. Figure "22" are the boilers, which are one on each side about six feet from the vat. They are made of one and a half inch lumber for sides. I bought fourteen foot planks, sawed them in two in the middle and then cut a circle on each end, then took sheet iron thirty inches wide and eight feet long and nailed it solid to the plank, which makes the bottom of the boiler. Across the top nail three pieces of 1x4 lumber, at equal distances, to keep it from spreading. These boilers should be set on a furnace built up two feet from the ground with brick or stone. The space between the two sides of the furnace should be eight inches narrower than the boiler, giving four inches on each side for the boiler to rest on. The furnace should be open at each end and a flue made of sheet iron seven feet long, and one made to fit either end of the furnace, so that it can be easily changed from one end to the other to correspond with the direction of the wind. This flue being seven feet high will conduct the smoke out of the way of men and sheep. Fig. "77" is a pipe running from boilers to vat to conduct the dip from boilers into the vat. One end of the pipe should be set into the side of the boiler even with the bottom; the other end let in the side of the vat, by means of a notch cut two inches deep. The pipe should be just even with the inside of the vat so as to be out of the way of the men and sheep. The bottom of the boiler being just the same height as the top of the vat, the two-inch notch cut in the vat will give fall enough for the pipe to empty the boiler. There can be a faucet put in the pipe next the boiler or anywhere between the boiler and vat, to turn on and shut off the dip. Fig. "33" is the dipping floor which is sixteen feet square, made of flooring well braced underneath with joists, and set up on a foundation high enough for the bottom of the dripper to rest on the vat. The foundation around the outside of the dripper should be built about three inches higher than the supports under the center so as to spring the floor enough to make the dip run toward the center, with a strip across the two corners next to the vat, to conduct the drippings from the sheep into the vat. This drip-

ping floor should be inclosed by fence. Fig. "5" is a panel fence fourteen feet long placed across the center of the dripping floor. Two of the bottom boards of the fence of the dripper on the side next to the vat should be cut out the width of the vat, and a small gate (fig. 6) fastened to the division panel so that it can be swung to either side of the vat, that when one part of the dripper is filled with sheep this gate can be swung around, closing the pen that the sheep are in and leaving the other side open for the sheep to go in. By



HERDWICK RAM.

the time this last half of the dripper is filled with sheep the first lot will be ready to go out, and continue in like manner until dripping is finished. Fig. "44" are gates to let the sheep out of the dripper. Fig. "8" is the yard for the sheep before the dipping is commenced. It should be built so as to make a small, three-cornered pen (fig. 9) next to the vat, large enough to hold fifty or seventy-five sheep which would be handy to the vat and easy to catch. This yard should be made penitentiary tight and strong so that it is impossible for any sheep to escape undipped. Should a single sheep get out and get with those already dipped, unnoticed, that had a single living female acarus on it, it would in a short time infect the whole flock; hence the importance of thoroughness from beginning to end. Now, with the above arrangements and the dip hot, you are ready

for work. If desired to be run to the full capacity, which is about one thousand sheep per day, six good, strong men will be needed, one to attend the fire and foresee the work and see that every man does his duty. This overseer should be the owner of the sheep or the one most interested. If the sheep are very scabby two men should be stationed in the sheep pen with a currycomb or stiff brush to thoroughly scratch and break up every scabby patch on the sheep, then put it in the vat head first. Now, the man who stands at the first division of the vat takes charge of the sheep and thoroughly rubs all the scabby spots, and moves it easily up and down in the dip in order that the dip can penetrate all wrinkles and folds. This man should occupy fully one minute with each sheep, then pass it under the crossbar to the next man who handles it in the same manner and the same length of time, then passes it to the third man who does likewise. There is room for two sheep in each department of the vat at the same time, and one man can attend two nearly as well as one. It will be found very important to have those crossbars in the vat, or the sheep will all rush to the other end of the vat and will climb on each other, and it would be very hard for the men to hold them back and thoroughly soak them. If only dipping for a preventive for ticks or lice, one man in the sheep pen will put them in the vat fast enough; also one man can attend them along the vat and one dipping will be sufficient, but for scab it requires two dippings from eight to ten days apart. If these directions are carried out I am positive it will cure the worst case of scab, as I have cured thousands for myself and neighbors in precisely the same manner as here described. This apparatus, if well taken care of, will last for years and would serve a number of flockmasters. If the flock is small this apparatus can be built on a smaller scale, or larger to suit the number of sheep that are to be dipped.

A HAND DIPPING TANK.

After an exciting contest for the one-hundred-dollar sterling silver cup offered, some months ago, by Mr. Cooper for the best farm dipping-plant, the prize was won by Mr. W. B. Vestal, of Plainfield, Ind. The following are the plans and specifications given by Mr. Vestal:

We have a dipping outfit which I made and which any farmer can make at small cost, and it answers the purpose. Two men, one on each side of the vat and our little nine-year-old Willie to keep the sheep massed in the chute, will handle them at the rate of about one sheep every four or five minutes, and that will allow the sheep to remain in the

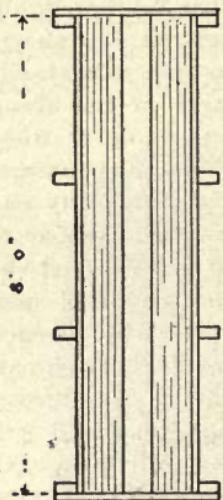


FIG. 1.

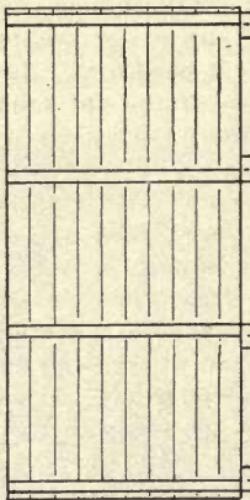


FIG. 2.

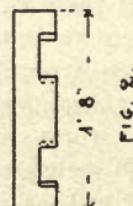
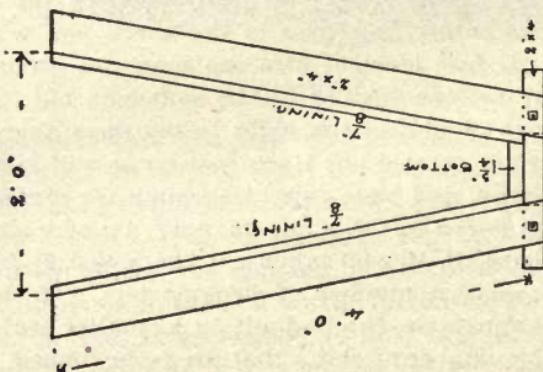


FIG. 4.

dip two minutes, "by the watch," and should not be guessed at.

To make the dipping-vat use 2x4 stuff; cut eight pieces 4 feet 2 inches long, and four pieces 20 inches long, and frame by halving together, as shown in Figs. 1 and 2. Now take the four frames and set them on a level floor, and nail temporary strip on the outside to keep them in position. Use

first-class flooring for sides and ends; paint tongues and groove as you put them on; commence at the bottom, grooved side down (plain the groove off the first boards), and build up, letting the ends extend past the posts at each end so that they may be sawed off afterwards to insure a good joint at the corners. The bottom should be $1\frac{3}{4} \times 6$ inches, with the edges beveled to correspond with the flare of the sides. Draw down with $\frac{3}{8}$ bolts and nail the side planks to the edge of bottom board, and you will have a water-tight joint. Now after sawing the side planks flush with the outside of end posts, seal up ends on outside of posts. Paint the inside thoroughly, and you will have a water-tight box. You can nail quarter-round in the corners if necessary, but ours has none, and does not leak, and has been in use for three years. I like the dipping-vat 8 feet long, so as to allow an incline for sheep to walk out on. They will climb out with little assistance if so arranged. We have a small tackle hung near the exit end of the vat, so that in handling very heavy sheep we have a saddle girth, with ring on each end, which we put under the sheep behind the forelegs; hook the tackle into the rings, and one man will easily lift a 300-pound sheep; but we seldom use the tackle, as the sheep naturally walk out with little assistance (and 300-pound sheep are very scarce with us; we have not succeeded in raising many of that kind). We let the vat into the ground 2 feet, so the top stands 2 feet above the surface. Bore an inch hole in bottom to drain off liquid when done (1 inch, so that it may be stopped with a corn cob); bury an old box or barrel a short distance from the vat, and make a drain from the hole in vat to it, and there will be no danger of chickens or other stock drinking it.

In Fig. 3 I have tried to give an inside view of the vat, and in Fig. 4 a side elevation before being let into the ground or floor. From the exit end of the vat extends the draining-table, which should be about 4 feet wide and of any desired length, with the outer end elevated so as to drain back into the vat with a strainer to catch any filth that might accumulate on the table.

I will endeavor to illustrate in Figs. 5 and 6 how to build the draining-table. Use for sills 2×6 inch at intervals of 2 feet to nail the floor to. Say you make the first section 14

feet; you can let the next lap on the first and extend as far as you desire. Shape the sills as shown in Fig. 5, and regulate the pitch by the length of the legs as shown in Fig. 6. Set the sills in line, nail temporary strips on ends to hold in position and proceed to floor, taking care to paint well the tongues and grooves, and when done give two good coats of paint to prevent shrinking and swelling. The legs may extend upward for post to nail planks to prevent the sheep

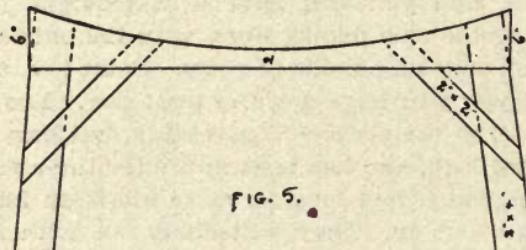


FIG. 5.



FIG. 6.

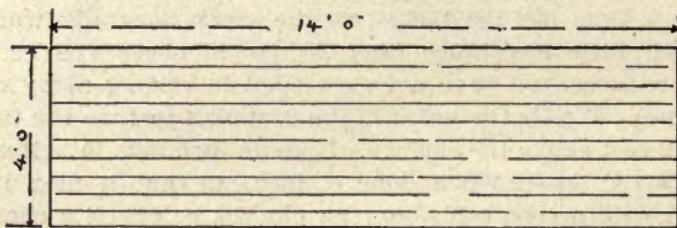
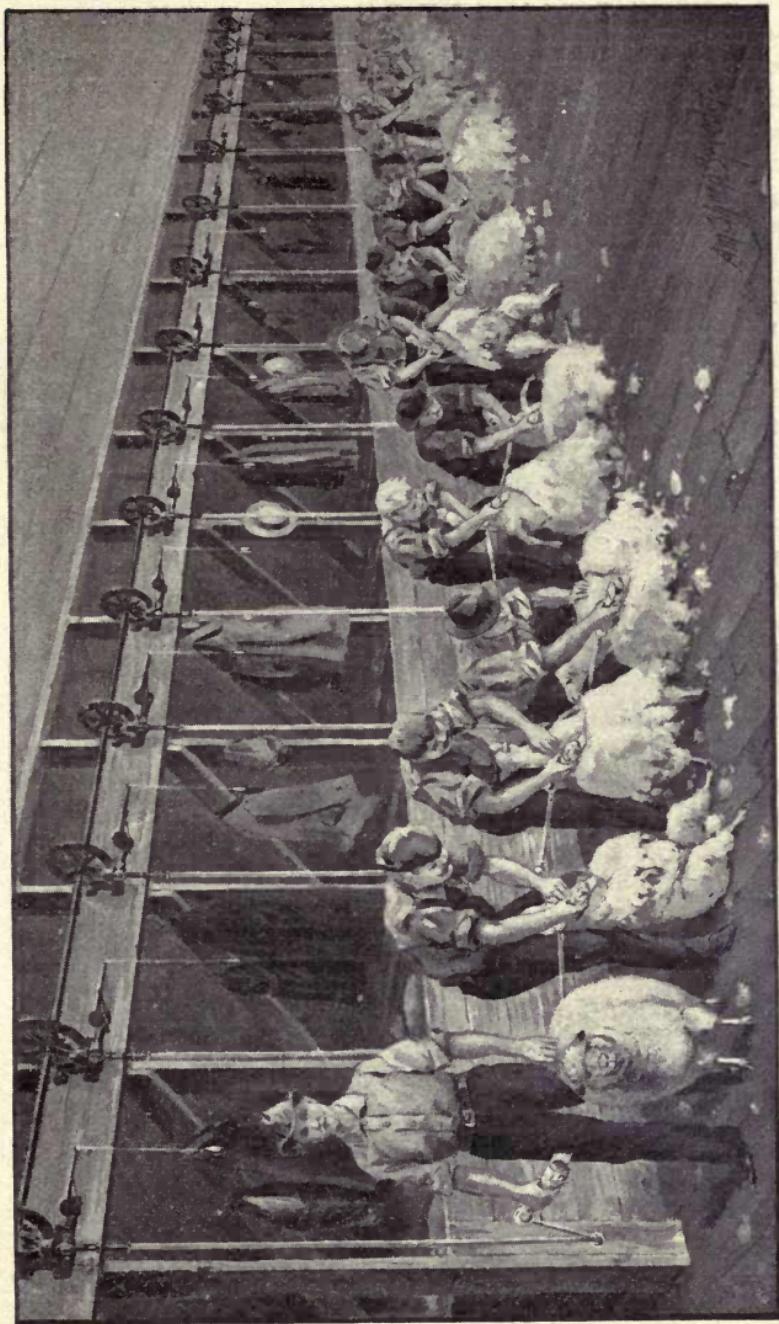


FIG. 7.

jumping off. A small gate or bar at the end to let them out when they cease to drip completes the draining-table. Fig. 7 shows draining surface of the table. We find 14 feet of draining-table is sufficient for our use. We do not consider it any great job to dip our little flock of 100 to 150 sheep.

SHEARING.

This harvesting of the wool crop, as it may be termed, is one of the important parts of the shepherd's industry. It is really his harvest time, and it goes very naturally that in the advance of mechanical methods, the machine now



A WOLSELEY SHEEP SHEARING MACHINE PLANT

in use for gathering this harvest, is made on precisely the same principle as the mower and the harvester. That is, that the reciprocating cutting blade, is of the same form and has the same action as those machines. It is somewhat of a reproach to the enterprise of American shepherds, that although a machine for shearing on this principle was invented and made over twenty years ago, when the author used it, and probably sheared the first sheep by machine, in this or any other country, it has been in long use in Australia, and is only recently in use on our American sheep ranches. But it has come, and come to stay, and as but little power is needed to run it, and it does the work quickly and with perfect safety to the sheep, it may be profitably used even on comparatively small sheep farms. This same machine has been in use for clipping horses, and even in the barber shops of our large cities, while it has been neglected until now by our sheep men. The now perfected machine will be a considerable saving of expense, and unquestionably will be utilized much in the same way as the peripatetic thrashing machine is, that is, carried from farm to farm to do the work where it will not be profitable to keep the outfit especially for one's own use.

The method of shearing on a large sheep ranch is shown in detail at fig. 34. The cost of this special operation is about three cents per head for the shearing only. The work done includes the shearing, tagging, rolling the fleece, and packing them into sacks, when they are weighed and ready for shipment. The sheep in this case are sheared unwashed, and on the whole this plan, which is the same as that adopted on the great sheep runs in Australia, is the most economical. The picture sufficiently explains the whole business, from the penning of the sheep to the sacking of the wool for shipment.

SHEARING BY HAND.

The beginner will be more interested in this method of hand shearing as it is best adapted for small flocks. The sheep are penned in any convenient way near the shearing floor, which—by the way—must be kept clean by sweeping up the refuse, the tags being gathered by a boy along with the sweepings, and afterwards hand-washed. The sheep is

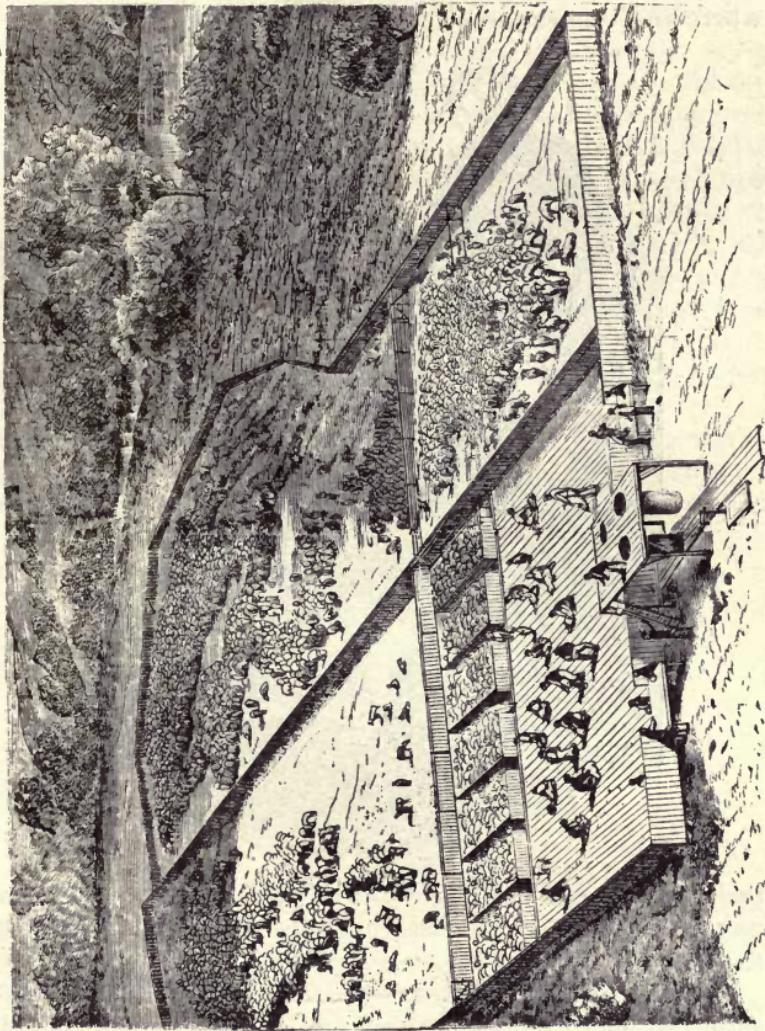


FIG. 34.—AN IDEAL WESTERN SHEARING PLANT.

first set up on its rump, when the shearer cuts the wool down the belly to the sides, around the throat, and to the neck. The sheep is then quietly held on its side, and the wool loosened to the back bone and a little over it, as seen where the stooping shearer is at work. The sheep is then

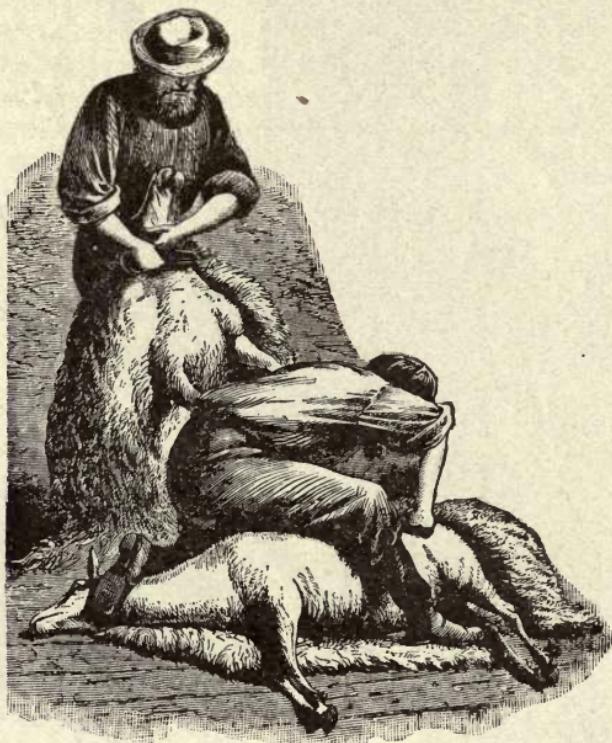


FIG. 33.—Hand Shearing.

turned over, and the fleece cut on the other side. In this sort of shearing one must carefully avoid under cutting, that is, cutting the wool above the skin by taking too deep a cut, or holding the shears with the points too high. This either leaves ridges in the wool left on the sheep, or double cuts it, making a waste.

A convenient tagging bench is shown at figure 35. This is used to hold the sheep while the tag locks are removed. The sheep is then passed over to the shearing bench on which it lies more comfortably and easy, and is consequently less

restless than on a flat floor. It is also more under the control of the shearer, who by slipping a strap over the neck holds the sheep better and without struggling, as it may otherwise. When the fleeces are removed from the sheep they are folded by turning over the sides and rolling them into a compact bundle (fig. 37) which is tied at each end with soft wool twine. They are then ready for storing or for selling. If stored they should not be kept in too dry a place,

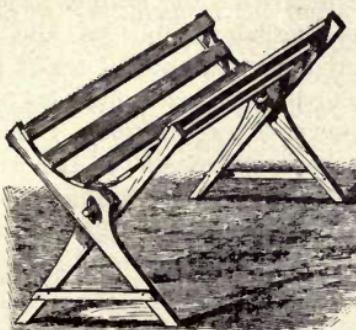


FIG. 35.—Tagging Bench.

or they will have a harsh feeling when the buyer comes around, or they are sent for sale. A shaded shed is a good place to keep them in, in which they will not dry out too much. A moderate degree of dampness is requisite to preserve the softness of the wool, and its elasticity and strength of fiber. It has been found, that by over dryness, wool will

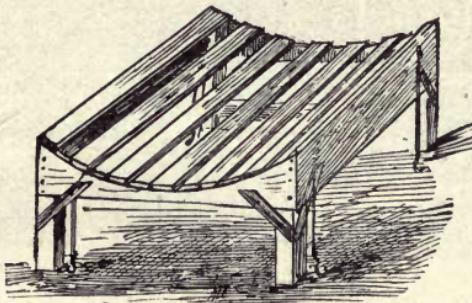


FIG. 36.—Shearing Bench.

lose one-fourth of its strength, just as a sliver of elastic wood will become hard and brittle by overdrying. The moisture natural to the wool is to be preserved while it is in storage.

A few words might be said just here in regard to a reprehensible practice of shearing, the intention of which is to disguise the form of the sheep and give to it false and deceptive appearance by which judges at the exhibitions may be induced to estimate the animals so disguised above their real character. It consists in leaving the fleece, at the shearing

longer in some parts of the body than in others, so as to increase the value of special points of excellence in the form, as well as to add to the length of the staple. This nefarious trick is common in the English exhibitions, and is winked at by the judges, so that the most skillful adept in this distortion of the form secures the prizes and leaves the honest exhibitor in an undeserved low position. It has been known too that exhibitors have descended to the low trick of washing their show sheep, and coloring the fleece with yellow ocher and oil, so as to give a false appearance

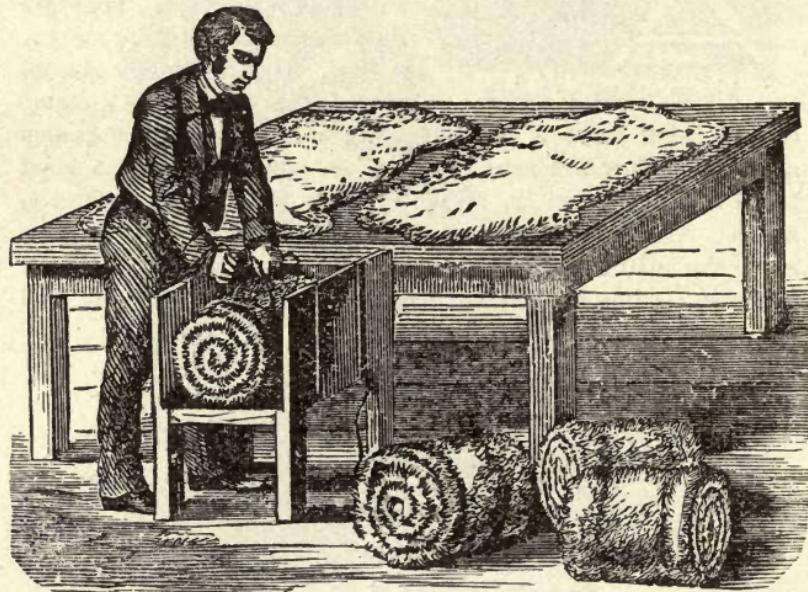


FIG. 37.—Tying Fleeces.

and feel to the wool. It is well that judges at exhibitions should be cautious to inspect the stock and be about in good season, and at times when these tricks may be practiced by the shepherds in charge of the sheep in the various pens. And while this deception may not be frequently practiced, yet it is well that all concerned should be on the lookout for it, and insist on the disqualification of the animals so distorted, and levy a substantial fine on the delinquents. This is simply a matter of justice to all honest exhibitors. The author is free to say, and happy to testify, that this practice is by no means common at our exhibitions, but still

it has been known to have been effective in misleading judges who have been careless in giving thorough examination to the sheep in the pens. At the same time exhibitors should take all honest means to put their sheep in the best condition for the examination by the judges; for it sometimes happens that the best may lose position for want of being duly prepared for the competition.

SORTING WOOL.

There are several qualities of wool in a sheep's fleece. The character of the fiber varies the least in the Merino breeds, more in the coarse wools, but most in the common natives. But in all there is a difference. This is best seen in the illustration, fig. 38, of what is known as a skirted fleece. This is an Australian fleece, and it is to this method of sorting the wool of a fleece that our tariff is applied. The skirted

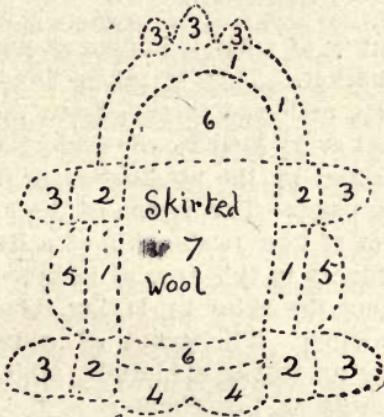


FIG. 38.—A Skirted Fleece.

1, Firsts, neck and skirts; 2, Second pieces; 3, Third pieces; 4, Stained wool; 5, Belly wool; 6, Broken wool; 7, Skirted wool.

wool being the best part of the fleece, is subject to the highest import duty, on account of the higher value of it. The fleece being laid on the wool-sorter's table, this expert individual tears it to pieces, separating the various qualities, as if by instinct, into the different grades. These are mentioned under the engraving.

This example is an object lesson to the breeder whose ambition and business it is to improve his flock. For it is evident, the more the fleece may contain of the No. 7

wool, as it is here numbered, the higher the value of it will be. And the more of the coarser wool in the fleece the less its value, and of course of the sheep, as well as of its wool. The Merino sheep, in all its several varieties, is an interesting example of the skill of the breeders by which these sheep are clothed from the tip of the nose to the hoofs, with valuable wool. There is thus a great difference between a pure Merino and a grade. But by breeding up of the flock by the use of the best selected sheep, chosen for this high grade of fleece, it is evident that the special wool grower may in a few years so grade up his flock as to largely increase the value of it by the better wool grown. It will be a useful study for the intelligent shepherd to examine carefully this diagram of the skirted fleece, and apply the hints it will afford to his culture of his flock.

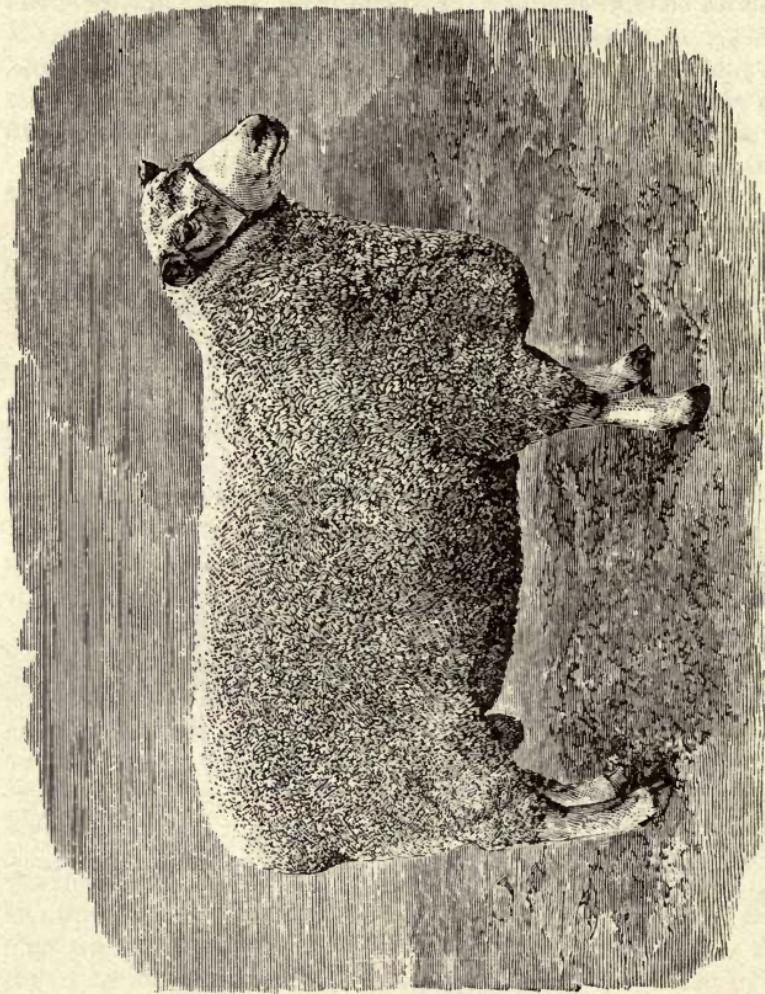
PULLED WOOL.

A large quantity of what is known as pulled wool is always on the market. This is taken from the skins of slaughtered sheep, and—sad to say—from the thousands of sheep that are lost every year by the neglect of their owners. The wool is loosened by the application to the back of the skin of thin lime paste. This is one of the examples of the detrimental effect of lime to the skin of a living animal, as well as its usefulness in this special instance. The wool is also loosened from the skins by laying them when wet in heaps one on another. The pelts of course sweat and partly decompose as to the epidermis, which as has been explained previously in this chapter, is the part in which the wool fibers are rooted. The sweating of the skins in this process causes the wool to loosen, so that it may be easily removed, without seriously affecting the value of it. Thus the market value of pulled wool may vary considerably with the skillfulness or otherwise of this process of separation. The wool of a sheep, dead of any disease, is materially reduced in value, and the more so as the kind of disease may happen to be. Sheep dying of any contagious disease, such as anthrax especially, is frequently the cause of the infection of the handlers of the skins or wool. The almost invariably wool-sorter's disease, as it is called, is precisely this same disease of which the sheep died, and is one of the most .

dreadful of all causes of death. It is accompanied by blood poisoning, of which the results are most painful boils and carbuncles appearing all over the body, and which produce such severe shock to the sufferer, that death is almost certain. Recovery is rare, and the sufferings of the unfortunate victim of the ignorant or thoughtless owner of the dead sheep, are so severe as to be a caution to all concerned, never to touch a sheep dead of this disease except with a long pole, as the saying is, to turn it into a deep hole dug on the spot where it is buried safely. But all contact of the hands with the carcass is to be most carefully avoided.

CARE OF THE SHEARED SHEEP.

As our shearing time occurs in a favorable season of the year, but little need be said as to the care of the newly-shorn flock. Necessarily some thought is to be given to this, in the way of protection against unfavorable weather. Warm rain is not hurtful, but rather the opposite. Cold rain is to be avoided, and if it happens, the sheep should be sheltered for a short time until they have become used to their thin Summer clothing. The English shepherds smear the sheep with some kind of cheap grease, mostly the waste butter purchased at a low price from the dealers. We might say with some sort of truth that there is an abundant supply of this article to be procured here, as well as in other countries, and if such waste stuff might be thought desirable to shed the rain from the bared sheep, it would not cost much to procure and use it. Cuts that have been made should be treated with some antiseptic ointment, or tar, either will be advisable, as a protection against the flies, which might blow the sheep and cause serious trouble. The application will tend to the quick-healing of any wounds that may have been given in the shearing.



A WENSLEYDALE RAM.

CHAPTER VII.

MINOR BRITISH BREEDS OF SHEEP.

THE HERDWICK

is a hardy, active, resolute and self-helpful race of sheep, pure bred, highly prized and most common in the beautiful lake and hill country of Cumberland and Westmoreland counties where tradition says they were first introduced by the escape of some forty sheep from the wreck of Spanish galleons on the Cumberland coast in 1588, since which period they have been assiduously cultivated by the northern hill farmers. The characteristics of the breed are well outlined by Mr. Jas. Bowstead, a very competent authority, as follows: "The essential points of a Herdwick are a heavy fleece of fairly strong wool disposed to be hairy on the top of the shoulder, growing well down to the knees and hocks, pole and belly well covered, a broad, bushy tail, and a well defined topping broad head, nose arched, or Roman, nostrils and mouth wide, teeth broad and short, jaws deep, showing strength of constitution and determination, eye prominent and lively, and in the male, defiant; ears white, fine, erect and always moving, as has been said like a butterfly's wing. The color or markings of the face and legs is very important. There should be no spots or speckles, nor any token of brown, as these are considered sure tokens of a cross. When the lambs are born their legs and heads should be perfectly black, with the exception of a little white on the tips of the ears, and perhaps a few white hairs round the feet. These white hairs gradually increase, so that at six months old, one-third or one-half the ear will be hoar-frosted, and there will be distinct bands of the same round the feet, shading off to the black of the leg, and by this time also about an inch of the muzzle will have become frosted too. This change of color goes on until some, at the age of three years, are perfectly white, while others remain a kind of steel

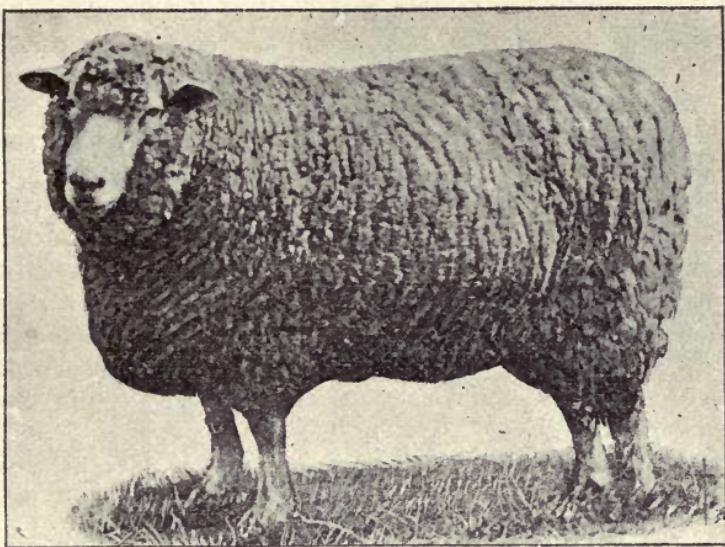
gray. Horns in the ram are desirable, but not essential, and undoubtedly add much to the appearance, but otherwise are not much valued. White hoofs are much preferred. * * * * * There are many yeomen in the dales of Cumberland and Westmoreland whose flocks have been handed down from father to son for generations without a blot or stain on their pedigrees, and he would be a degenerate son who would dare to try a cross." The Herdwick, like most of the mountain sheep, is distinctively a mutton sheep, much prized for the fine flavor of its flesh.

THE RYELAND SHEEP

The old Ryeland was well scattered over Staffordshire, Shropshire, Monmouthshire, Herefordshire and Gloucestershire a century and more ago, and as early as 1800 numbered 500,000 in Herefordshire alone, but for some reason fell into disfavor and decline almost to the point of extinction. It was medium sized, running from 12 to 15 lbs. to the quarter in the wether, and 10 to 12 lbs. in the ewe, was white-faced and polled, with small clean legs, light bone, compact, round body, a 2 lb. fleece of very fine wool, had great powers of endurance, and so much favored the Merino in appearance, character and habit, as to suggest a possible foreign origin.

THE NEW RYELAND,

while holding some of the better characteristics of its less showy and less pretentious ancestor, has greater size, symmetry and weight of fleece, lambs under 12 months yielding as high as 18 lbs. per quarter, and yearlings 20 to 24 lbs. to the quarter, the fleece, though not so fine as in the older breed, ranging from 6 to 8 lbs. The New Ryeland, which doubtless owes much of its fine size and style to early Leicester crosses, is still hornless and white-faced, with short, close, even wool, and is clearly a distinct breed, quite unlike any other. It fattens with remarkable facility, matures quickly, yields an excellent quality of flesh and is fast coming into favor for its inherent value, as a wool and mutton sheep, and especially for crossing on other breeds. Mr. Frank Shepherd, who has had a life-long association with the breed, says: "The Ryeland is one of the oldest of British breeds of sheep, and to my mind is one of the best all-round breeds



RYELAND RAM.



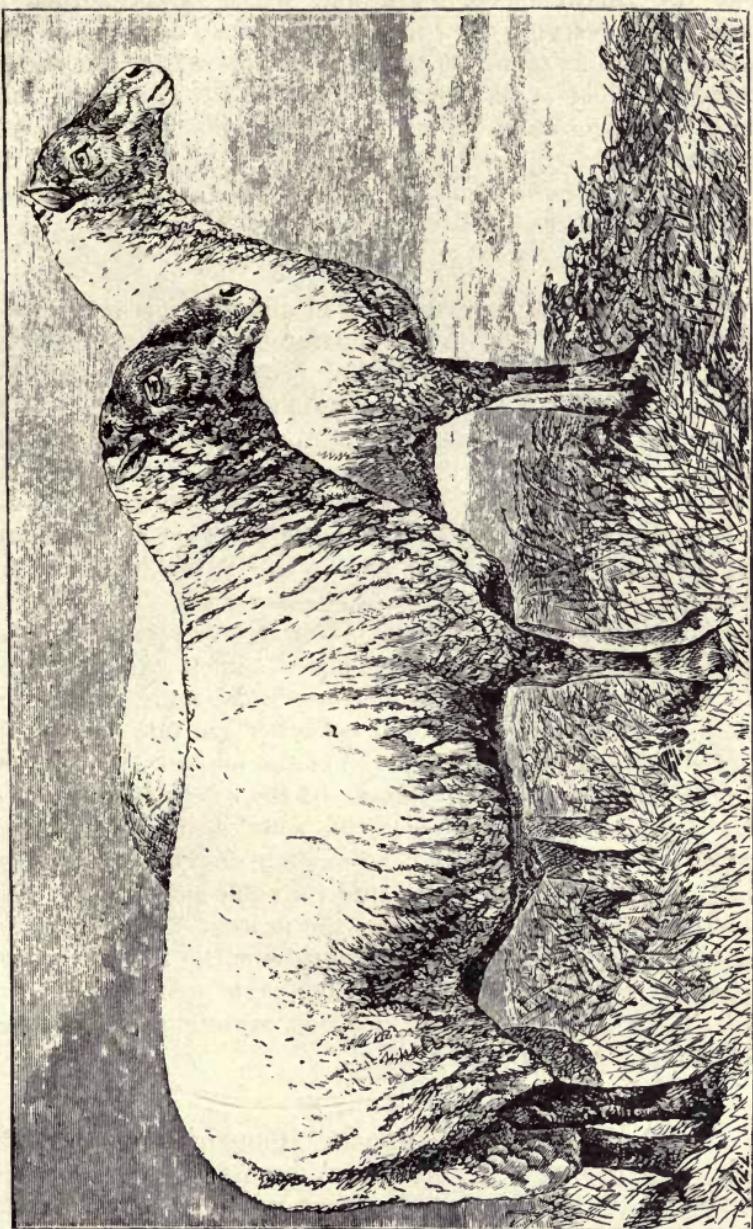
LONG RAM.

we have, producing mutton and wool of the finest quality, with great constitution, invaluable for crossing purposes. It is a common saying in Hereford market that 'no sheep will get fat lambs like a Ryeland ram.' The Ryeland of to-day is a much heavier sheep than was the case thirty or forty years ago and arrives earlier at maturity—compact in form, straight back, sides and underline, on short, well-set, white legs, a white face, thick scrag, and head well covered with wool. No better wool is grown on any sheep. As a hardy, farmer's rent-paying sheep, I have no hesitation in giving the preference to the Ryeland." Such is a brief outline of the history and characteristics of a breed of sheep destined to hold a conspicuous place in the world's future sheep farming.

Among the minor English breeds, which have in recent years been honored with a class at the Royal and other shows, is

THE LONK,

of which the following mention is made by Mr. Dixon in the Royal Agricultural Society's Journal: "The hill ranges of Yorkshire and Lancashire are believed to be the earliest home of the Lonks. We find them extending north from Clitheroe, over the forest of Bowland towards Lancaster, east of Colne and Skipton as far as Keighley and Ben Rhydding, and south along the 'back-bone of England' by Pendle Hill, Burnley, Todmorden and Bacup, almost to Blackstone Edge. The Penistone breed, a shorter and thicker description of Lonk, there hold the hills. Derbyshire also has Lonks on most of its hills and peaks, and its flockmasters often go over to report progress at the Craven Show." Youatt undoubtedly refers to the Lonks in the following note: "In the West Riding of Yorkshire and on the border of Lancashire, a breed of short-wooled sheep has existed from time immemorial. They are horned, with mottled faces and legs; some of them, however, are white-faced. It has been crossed more toward the south of the Riding with the Cheviot and Leicester, both of which have improved it. Towards the north it has been oftener crossed with the Heath sheep, and then the legs and faces are black, gray or spotted." Prof. Wrightson says of the breed: "The Lonks are a distinct breed, and are most valued on low-lying, damp and mossy land. They are



RADNOR RAM AND EWE.

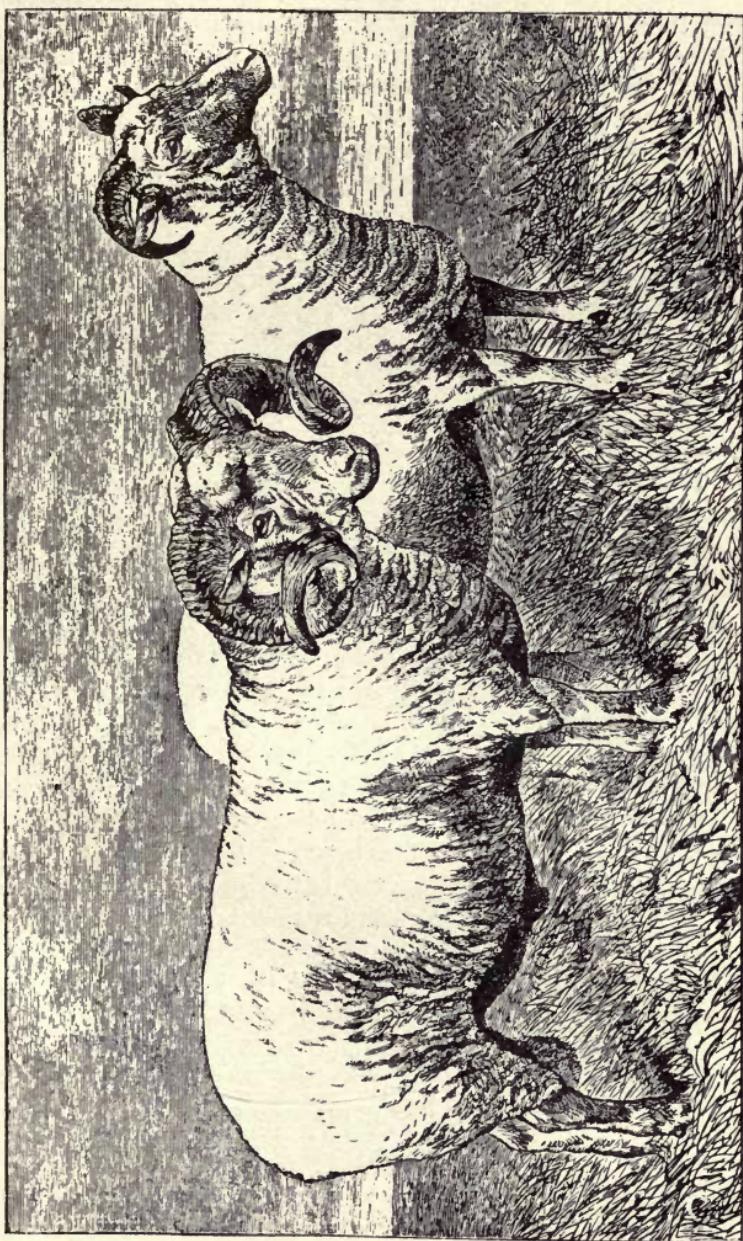
like the Heath sheep, black and white faced, horned in both sexes, carrying a superior fleece of fine, moderately long wool, which is closer in texture, more springy and elastic than the wool of the Scotch Black-faces. The breed is peculiar for resisting the effects of a damp soil. The Lonk is a larger, thicker made, and better wooled sheep than the Scotch Black-faced, and was well represented at the show of the Royal at Chester in 1893."

THE ROSCOMMON

of to-day is a comparatively recent and very great improvement on the old, large, raw-boned, ungainly native sheep of Connaught, the chief sheep raising province of Ireland. The earliest modification of the ugly old Connaughters, both in form and fleece, was effected by Leicester rams skillfully mated with native ewes by the most intelligent breeders of Roscommon County. Later improvement came by careful selection, resulting in a stately, massive sheep of commanding presence, noble, if not handsome. Yearling grass fed wethers yield 25 and 30 lbs. and older ewes from 30 to 40 lbs. to the quarter of superior mutton. Early maturity, too, seems characteristic of these sheep which carry 7 to 10 lb. fleeces of soft, pliable, lustrous long staple wool. Not alone to favoring crosses and selection are due the stately and massive form and rich fleece of the modern Roscommon. Environments—salt sea breezes, with their favoring humidity, the rich herbage and browse, the soils, geology and topography of Connaught—have had much to do with the development of this breed of sheep into its noble proportions. The Roscommon is rather large for the present English mutton fashion, but fashion may change to suit the noble Roscommon, or the Roscommon may change to suit the fashion. This is an age of marvels in sheep evolution and changes follow each other thick and fast.

THE RADNOR

is a native of Radnor, Merioneth, Montgomery and Brecknock Counties, Wales, and one of the old mountain breeds, originally very small, but now bred up to medium size and good form through Leicester and Shropshire crosses, until at maturity (three or four years old) the well bred and well fed wether turns a twelve to fifteen lb. quarter and the ewe



EXMOOR RAM AND EWE.

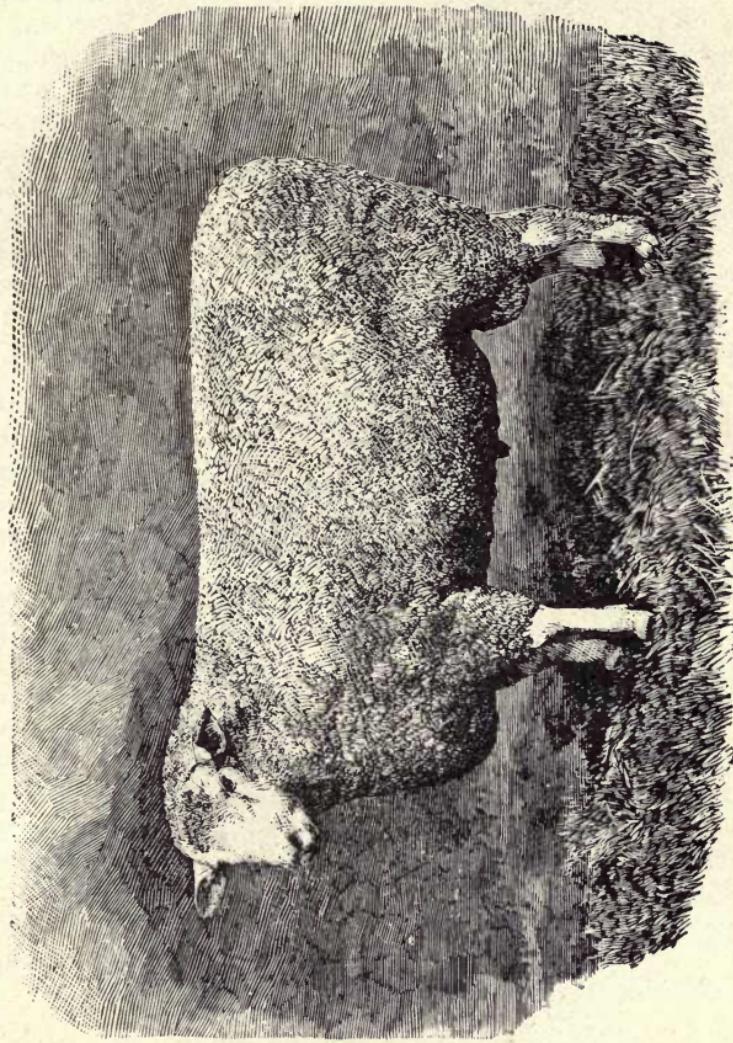
a nine to twelve lb. dressed quarter. The ewes are prolific, good milkers and mothers and are much sought after by feeders in the near English counties for raising mutton lambs. Like all the Welsh sheep of the mountains, the Radnor, though not a ready feeder, is a producer of high quality mutton. The old native Radnor carried a very large heavily woolled tail and was hairy at breech and breast; but his modern descendent carries a 4 or 5 lb. fleece of fine quality wool, horns in the ram, ewes polled, but sometimes with rudimentary horns, a black face, varying to tan, gray and even white, and a light fore-quarter, and is a very hardy, active, self-reliant sheep, and though favored with recognition at some of the great shows, is a provincialist, best suited to his bleak native habitat and never likely to take a prominent place in British husbandry.

THE SHEEP OF NORTH WALES

are characterized by Mr. Morgan Evans as "principally white-faced, though some have rusty brown, others speckled and others gray faces. The males are horned, the ewes generally hornless, though sometimes with very short horns and occasionally with horns equal in size to those of the ram. The head is small and carried well up, the neck long, poll high, shoulders low, chest narrow, girth small, ribs flat, rump high and tail long. Average weight of ewes 7 lbs. per quarter. Three year old wethers, 9 to 10 lbs. per quarter, and the mutton famous for its delicacy. The average clip of wool is about 5 lbs. per fleece of fine quality, but in some districts it is mixed with long hairs about the neck and back." All attempts at improvement of these little mountain sheep have ended in failure. They are the natural product of the bleak, semi-barren Welsh hills, the heather, a rigorous winter climate and generally hard conditions, modified by the salt sea winds, and in their best estate, are likely, though diminutive in size, to long remain the unapproachable, superlative mutton sheep of the hill country.

THE EXMOOR,

like the Dartmoor, are native to the North Devon and neighboring mountains, and in their original estate bore noticeable resemblance to the Dorsets, of which they were near neighbors. They were naturally wild and nomadic, carried light



A DEVON LONGWOOL RAM.

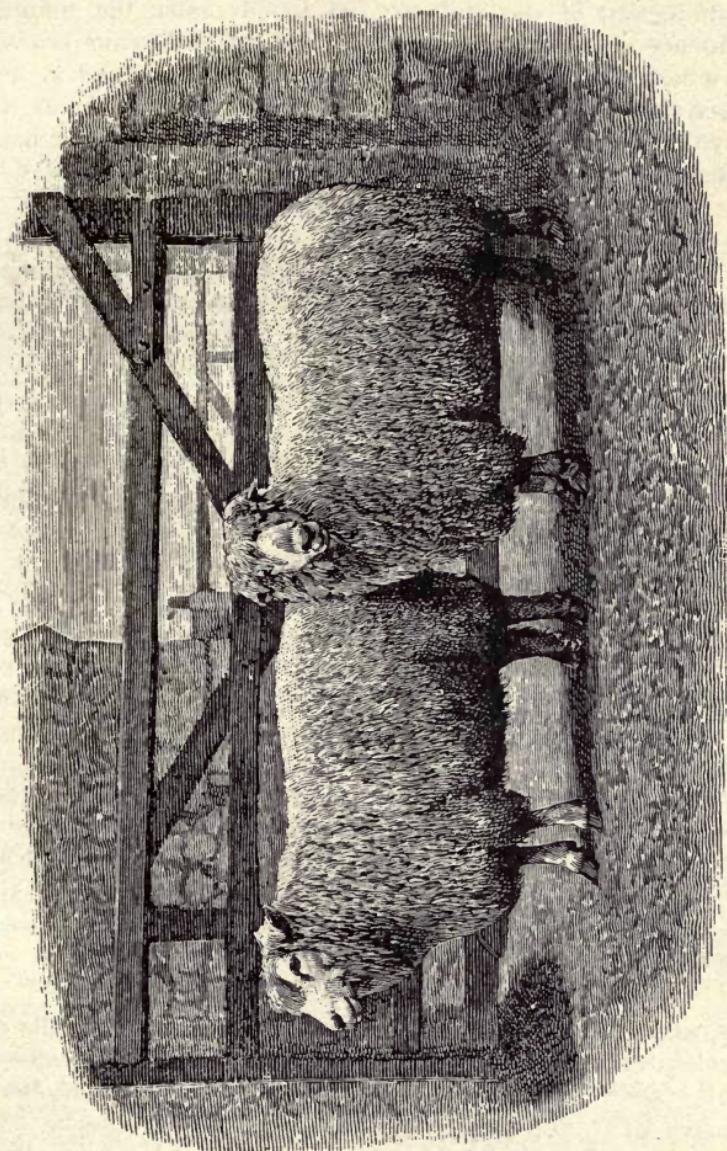
fleeces of coarse wool, were horned in both sexes, and like most of the mountain breeds that ranged in the heather and subsisted on browse and the scanty herbage of the higher moorlands yielded fine flavored mutton. The Exmoor, which has been greatly improved in the last half century by Leicester crosses, is relatively, a medium sized, white faced, white wooled, white legged and very hardy sheep, with prettily turned horns, long round barrels, broad loins, short legs, drooping shoulders, rather faulty neck and moderate shoulder girth, and carries a fleece of about five lbs. of wool. Where well bred and fed, the mature Exmoor dresses from ten to eighteen lbs. to the quarter. This breed of sheep, like the Dorset, matures early and the ewe is a prolific lamb bearer, very frequently presenting twins and triplets. The breed is noteworthy, too, for its unusual longevity, and in the quality of its mutton has few equals.

THE LIMESTONE OR CRAG SHEEP,

which have found ready recognition and a good representation at the Royal and other shows, are mainly confined to the rugged moorlands of West Yorkshire and East Lancashire where they are near neighbors of the Lonks. Youatt speaks of them in this wise: "Towards the borders of Westmoreland the Limestone breed of sheep are found. They are natives of that part of the country and singularly confined to it. It is a horned breed, with white face and legs, depasturing on a rocky limestone land." Prof. Wrightson describes them as follows: "Both sexes horned, face and legs white, wool firm, intermediate in length, and inclining to the character of short rather than long wool. Wethers 18 to 22 lbs. per quarter at twenty months old. Females very prolific. Out of fifty-four ewes in a given flock, thirteen produced triplets, and the entire fifty-four brought up ninety-six lambs to weaning time." The Crag sheep, he says, are "well adapted for the dry and high lying moors of the mountain limestone and are able to subsist almost without water."

THE DEVON LONGWOOL,

a native of Devonshire, comes down through the centuries from the old Bampton, a large, swarthy, strong boned, heavily fleeced, white faced and hornless breed of sheep, that got their great size and bone from the rich Bampton pas-



DARTMOOR RAM AND EWE.

tures, ages before some of the present popular breeds of British sheep were born. The Devon Longwool of to-day is a reproduction of the stalwart old breed under the refining influence of Leicester and Lincoln blood, numerous crosses of which are apparent in its present bodily symmetry, fine fleece and well established type. It has found favor at the Royal and other leading shows and is unquestionably a most valuable member of the long-wool tribes.

THE DARTMOOR

of the present time, as the cut shows, is a long-wool sheep of large size, good form, long, heavy fleece and general character much on the order of the Cotswold and Lincoln, and quite unlike the raw-boned, angular and ugly native sheep of the mountains described by Youatt and other early writers. He is strong boned, white faced, white legged and hornless, with long white staple, is very hardy and as now constituted, the result of a cross of the Leicester and Lincoln on the native Dartmoor mountain sheep. The Dartmoor has been received with much favor at the Royal show and is really one of the valuable long-wool breeds of England.

THE GLAMORGANSHIRE SHEEP,

of South Wales, are small, with very little claim to symmetry of form or inviting features. They are white faced, white legged, generally hornless and carry a fairly dense fleece of short wool, not altogether free from hair, occasional tan colored legs are noted among them and are considered tokens of constitutional vigor. The mature fat wether dresses thirty to forty lbs., and the ewe from twenty to thirty lbs., or about six or seven lbs. per quarter. Like other tribes of Welsh sheep, they yield superb mutton, and so far, have not shown marked improvement when crossed with larger breeds from other parts of the kingdom.

THE CLUN FOREST SHEEP

are natives of the Clun Forest and Radnor Forest hills on the border between Wales and Shropshire, and were once a white faced, light fleeced sheep, but Shropshire and Ryeland crosses have improved them in size, form and fleece. The face colorings ranges from white to black with intermediate shadings of fawn, gray, brown or mottled. Wool and mutton of excellent quality, sheep and lambs mature early, general style good, but fixedness of type still wanting. A valuable sheep with more than average possibilities.

CHAPTER VIII.

THE DISEASES OF SHEEP. -- THEIR PREVENTION AND TREATMENT.

Prevention is better than cure. The modern methods and practice of medicine, both of the physician and the veterinary, are to prevent diseases first as far as possible, and under the careful and skillful use of every hygienic precaution, this system has had the good result of lessening the death rate of the cities to nearly one-half of the proportion of only a few years ago. The enforced cleanliness, the ample supply of pure water, the better ventilation of dwellings, the greater personal cleanliness of individuals, due to the copious water service of towns and cities, with the assistance of popular education in this respect, have all had this excellent result. So far this better manner of life has not been adopted in regard to our domestic animals, each owner of which is free to do, or to neglect to do, those things which are requisite for the welfare of his stock. But this matter must soon be brought under the same rule of action by the farmer, the shepherd, the dairyman, the horse owner, and all others interested in the pursuit of that branch of agriculture, which consists of the rearing and feeding of our domestic animals.

Fortunately the general study of the hygiene of animal life, and the enforcement of ordinary economy, have had the result of bringing this matter before the attention of our legislatures, and special hygienic laws have been made and enforced through which this saving of life, and money as well, have been effected. Laws for the destruction of contagious diseases both of animals and the common farm crops, by the destruction of the contagious germs to which they are due, are now beginning to bear fruit; and those deadly diseases by which flocks and herds have been decimated, and uncounted millions of dollars have been wasted, are yearly getting under control through the enforced precautions by which contagion and infection are avoided. The seab disease of sheep, for instance, by virtue of such laws rigorously enforced, no longer exists to the dread of the shepherd, but has already been brought under control in some countries, and it is the paramount duty of American shepherds to see that the same regulations should be made and enforced here, so that sheep may not be infected in their transport by rail from place to place, and the buyer of healthy animals may have either the assurance of safety, or satisfactory means of recompense for losses sustained through the neglect or carelessness of those who are the causes of loss in this way.

There is no good reason why in the course of two years at least every contagious and infectious disease of sheep might not be put an end to, and safety for the future insured. This would put millions of dollars into the pockets of shepherds and sheep breeders, and it is as easy to be done as that the yellow fever or the deadly cholera may be prevented from gaining entrance through our seaports. So far as may be required for this end, all concerned in saving our flocks from decimation should waste no time in calling for adequate legislation, and at the same time themselves practice every necessary precaution in the management of their own flocks. Next to this all concerned should study those most effective rules by which diseases, due to neglects of management and to parasites, may be avoided by the general destruction of these deadly enemies of the flocks. One kind of intestinal worms, for instance, is responsible for more than half the deaths of sheep. The fatal fluke worm has at times destroyed one-tenth of all the sheep in Australia, and thousands are lost here simply by the neglect to avoid the use of infected water drank by the sheep at ponds and sluggish streams, bordered by wet banks, on which this parasite is bred in its common host, an abundant snail. So with the equally injurious tape worms, which are taken into the sheep in their embryo forms, as they are voided by dogs and other carnivorous animals, as wolves and coyotes. There is no reason why by a simple method every dog may not be freed from the parasites, and rendered innoxious to the flocks.

And so it goes with other diseases, which—as we shall describe them—may be prevented by the drainage of low pasture lands, or the avoiding of certain geologically derived soils, the effect of which is injurious to the flocks, and others still which are due to faults of feeding, and the inadequate nutrition of the sheep. Others too may be due to irregularities of feeding, or to exposure to the severity of the weather, as to heat or cold, or to the want of needed dryness or cleanliness in the housing of the flocks, or to injurious plants which may easily be eradicated from the pastures. All these remarks are intended to put the shepherds on their guard, and by full information as to these common risks, lead to the avoidance of them and insure the safety of the flocks.

For the fuller information of the reader we shall give every name by which the common diseases are known; the common ones in use, as well as those best known to science; so that each may be easily recognized, and treated with understanding. Attention is called to the list of symptoms which indicate the special disease, so that every reader may as far as possible recognize the ailment by which his sheep may be affected, and thus more intelligently seek out the means of treatment. A list of remedies will also be found, which may be used in accordance with the prescriptions given. These will be rated for animals fully grown, and are to be decreased in proportion to the age and weight of each one, half for a yearling, and a fourth for one six months old. As very young lambs rarely call for treatment except through the dams, in such cases the judgment of each reader must be exercised as to

the proportion of each case. As some diseases affect only young lambs, it is to be understood that the quantities are for them specifically, when they only are mentioned.

The list of diseases are taken up alphabetically, which will be the most convenient arrangement. If the list of symptoms is first referred to, the disease indicated will then be found in its place, with the needed treatment described.

Before entering into the list of diseases it may be well to discuss that most important of the medical management of the ewes, which applies to the birth of lambs. The scientific name of this natural function is parturition.

PARTURITION OF THE SHEEP.

Ordinarily the ewes give birth to the lambs in the Spring. This is the most convenient time of the year in general, but in some instances, now, the lambs are desired much earlier, and indeed with the Dorsets, they are expected late in the Fall or early in the Winter. As a rule it is most profitable to have the lambs early, that is from the New Year on, until the early Spring. This is a convenient time, for the lambs are weaned in good season for the early fattening of the ewes, expected to be sold, and the lambs may be ready for market two months earlier than later ones, while they may be made to weigh ten or fifteen pounds more without any greater cost of feeding when the usual time of disposing of them arrives, towards the end of the season.

A weak ewe is always in more or less trouble at this time than those that have been duly prepared for the occasion by good care and feeding. The birth of a lamb is always easy when the ewes are strong, and there is ample milk for rearing the young things, which are really hardy; and once on their legs and having a drink of milk, are then about past all risk if due shelter is given them in severe weather. The absence of this shelter is a very costly instance of want of thrift on the part of the shepherd. A lamb is a small thing, but as he who takes care of his cents saves his dollars, so this old true proverb applies to this; and every lamb lost is just so much money out of pocket.

As the time for the appearance of the lambs approaches, and this is to be known by reference to the record to be kept by every shepherd, the most forward ewes should be separated into yards with pens attached, and a close watch kept over them. The indications of approaching lambing are the filling of the udder, and later the deeper color and swollen condition of the vulva. When these conditions are perceived the ewes should be brought into the enclosures around the pens, and watched if the weather is at all severe, and especially if it is raining; for a cold rain will kill a new born lamb that will easily withstand a temperature half way to zero, if it is dry.

Sheep are willful and obstinate, and unless controlled in some way they cannot help, they will give trouble. So that every provision should be made to have things so arranged that they cannot help but do precisely what is wanted of them. It is a rare thing

that any help is needed at the birth of the lamb, and quietness, and the absence of all disturbances by other sheep, and a watchful attention until the lamb is on its feet and trying to get its milk, are generally quite sufficient. What the shepherd wants to know is that things are going on right, and then to let the sheep and the lamb get on in their own way.

If a lamb is chilled, a hot bath is the best thing for it, and then to be wrapped in a flannel around its body. A teaspoonful of hot gin and water, a little sweetened, is the common panacea of the Highland shepherds for the restoration of a weak or chilled lamb; and it is certainly effective. Even on those exposed mountain pastures, it is rare that the losses of lambs reach over seven per cent, even in the worst of seasons, and when the shepherd's hut is almost buried in snow.

If a ewe refuses to care for her lamb, she should be put into a small pen, in which she cannot get away from the lamb's importunities, and generally it will be sufficient to hold the lamb to the teat and let it get a few mouthfuls of milk, after which it will take care of itself, and the ewe will submit to its importunate calls for nutriment. This care is more needed when twin lambs are dropped, and by due attention the majority of these will be successfully reared in this way without artificial feeding. Otherwise it will be wise to have a fresh cow handy, and feed the lambs that need it from a nursing bottle. It has been known that more than three hundred pairs of twins have been reared in a flock of six hundred ewes, through the good care and management of a skillful foreman who looked attentively to this part of his business.

If a ewe is weak, there is nothing better for her than a drink of warm oatmeal gruel given from a long-necked bottle, if she will not drink it without this help. This may be given four times a day, and in a large flock a supply of this nourishing food should be kept on hand and warm all the time. It will be a great help to have the weak ewes culled out before the lambing time is due, and by a little extra care to get up their strength by good nursing.

One of the worst things that may happen to a ewe, heavy in lamb, is to be chased by dogs. This is to be carefully prevented, and the shepherd's dog itself is to be watched at this time lest he might be too rough with some forward ewe.

Unnecessary interference with a ewe in labor is unwise. Let nature have its way until it is evident that help is needed, and then the careful use of the forceps, or a small hand, may liberate the lamb and afford a safe delivery. If the ewe is weak and prostrated, a dose of the ordinary cordial used by shepherds will act as a useful stimulant, after which some light liquid nutritious food will restore the strength.

There are occasions of such a presentation of the lamb that it is impossible to save it, and it may be a question whether the lamb or the ewe may be the most desirable to sacrifice. If the lamb is likely to be of more value than the ewe, it may be saved

by taking it from the mother by what is known as the Cesarian operation. This consists of the opening of the ewe and taking the lamb from her. This is a serious operation, but it has been performed safely, and both ewe and lamb saved. Or if the ewe must be sacrificed, and is in a hopeless condition of exhaustion, she may be treated with chloroform so as to make her insensible, and the lamb then extracted and reared by hand, or put on another ewe.

This operation is performed in this way. The wool is clipped from the right flank, and an incision is made large enough to insert the hand previously oiled or greased with carbolated vaseline. Five inches is about right. The uterus (the womb) is then brought into view, taking the utmost care to keep the intestines out of danger, for it is quite possible to save both ewe and lamb by skillful operation. The uterus is then opened, the membranes removed and opened, and the lamb taken, cutting the cord and tying it to prevent bleeding. The incisions are then closed by sutures, using every precaution to sterilize the parts by a spray of warm solution of carbolic acid or permanganate of potash. The lamb is fed with fresh cow's milk, or put to a newly-lambed ewe. The ewe is kept quiet and comfortable, and if the operation has not been delayed too long, it has an equal chance for recovery. Reports of thirty-four cases of this kind have been recorded, in which fourteen were successful, both ewe and lamb having been saved; in nine the ewe was saved, but the results as to the lamb are not given. The ewe alone was saved in five instances, in six the ewe died but the lambs were saved, and in only six both ewe and lamb died. St. Cyr, a noted veterinarian, says in his work, that this operation is decidedly dangerous for the parent, but may be made with success as to the lamb; but the mother may often be saved, if the due antiseptic precautions are taken and the body is carefully bandaged to support the wounded parts. If the mother's life is not the main object, by taking a sufficiently early time for the operation, the lamb may be saved in a large majority of cases.

The incision in the flank need not be more than five inches in length, and the intestines are to be carefully protected, and sprayed by the antiseptic preparation. The most effective stimulant for the ewe is a decoction of gentian, of which half a pint may be given after the operation is completed. As to other animals, especially cows, this operation has been generally successful.

RETENTION OF THE AFTER-BIRTH.

This is not at all common in the sheep as it is with the larger animals. The cause of this accident is weakness in the ewe, or the spasmodic action of the os-uteri, or passage from the uterus. The former is treated by giving stimulants to the ewe, such as infusion of laurel berries, with aniseed, infused in warm water as follows:

Laurel berries.....	2	ounces.
Aniseed	1	"
Carbonate of soda	2	"

Infuse in two quarts of water and give half a pint, repeated in six hours. This has been found almost universally successful, except where the latter cause has been in operation. In this case the application of belladonna ointment to the neck of the womb, and to give half a dram of the belladonna extract to the ewe in some warm gruel, have been found effective. In general this is not any serious matter, as in time the membranes will gradually pass away without any but a temporary inconvenience. This inconvenience is generally avoided by due care in the feeding of the ewes while carrying their lambs. A strong ewe will rarely be troubled in this way.

BLEEDING FROM THE WOMB.

Bleeding or flooding, after the birth of the lamb, is mostly due to the rupture of some blood vessel in the separation of the membrane from the walls of the womb. The treatment called for in this case is the injection of cold water, by means of a suitable syringe, into the womb, and a sponge dipped in solution of perchloride of iron should be placed in the vagina. At the same time half-dram doses of the perchloride should be given by the mouth, in solution, at intervals of three hours. It will be a help to rub other parts of the body, as the legs and neck, with any of the common stimulating liniments to produce a revulsion of the circulation to these parts of the body, thus relieving the seat of the disorder. This is an infrequent trouble with sheep, and is due mostly to some undue muscular exertion of the animal during the birth of the lamb.

INVERSION OF THE WOMB.

Sometimes after the birth of the lamb the womb, a red bladder-like substance, may be seen ejecting from the vulva. This is due to some weakness of the ewe by which the attachments of the womb are loosened, and through the failure of the passage to close, normally, the accident occurs. This disease has been known and described from time immemorial. It was mentioned by the old Roman veterinarian, Vegetius, who quite wisely—we think—recommended the use of an inflated pig's bladder as a passary, or compress, to be placed in the vagina. The bladder is inserted while collapsed, and is then inflated by blowing into it with a quill, when the neck is tied. This accident is quite frequent in the ewe, coming next to the cow in regard to it. It is most apt to happen through the retention of the after-birth, when the whole organ is averted with its contents. If this is the case these must be carefully separated at each attachment of the cotyledons, so as not to cause bleeding by forcible separation. If the union is not easily separated the membranes may be severed near the attachments, but with great care to avoid bleeding. The uterus is then washed with warm water, having a little alum, or extract of bark in it. It is then carefully replaced using a probe having a soft sponge tied to the end, and covered with a clean linen rag. This is dipped in carbolated vaseline, and by it the uterus is gently

replaced. The small bladder is then used as above mentioned. The ewe should have immediately a strong dose of whisky or gin, to allay muscular or nervous excitement. A small quantity of diluted tincture of opium may be injected into the uterus, at the same time. Necessarily the ewe should be kept very quiet for a time, and not be permitted to run with the flock until recovery is made.

If repeated eversion is threatened after this, the application of a padded bandage with an opening in the center, or a patch of soft leather should be fastened on the part by a suitable bandage, placed up over the back on each side of the tail, and under the belly, and fastened to a strap around the body.

INFLAMMATION OF THE VAGINA.

This is sometimes a sequel of a difficult birth, especially after the use of any of the preceding operations. The lips of the part are swollen, and of a dark color, and subject to irritation which causes the ewe to rub, and at times to lacerate, the part. The treatment should be simple washing of the part with warm water and carbolic soap, injecting as well two ounces of warm water in which half a dram of hyposulphite of soda is dissolved. Circumstances, such as the spread of this disease, among other ewes, have led to the belief that this disorder is contagious. It is certainly so to the ram at the serving season; and lest it might become chronic, it should be treated without delay. The treatment, when the disease is persistent, is to wash and inject the part with the hyposulphite solution, and to give half a dram of the sulphite dissolved in water, daily for a week, by the mouth.

GARGET OR INFLAMMATION OF THE UDDER.

This disease is rare with the ewe, except when she is deprived of her lamb too suddenly at the weaning time. It rarely occurs at the birth of the lamb, but yet may do so by reason of exposure to cold, especially wet cold, as of heavy Spring rains, soon after, or at the birth of the lamb. It soon yields to emollient treatment, such as bathing with warm—almost hot—water with a little alcohol in it. After bathing, the udder is rubbed gently by the hand, and vaseline applied. Two drams of Epsom salts may be given, and the feed should be only hay or grass. This disorder is apt to happen if the ewes are fed too liberally soon after lambing, with such exciting food as the oil cakes. A warm mash of oatmeal with one-fourth as much linseed meal may be given twice a day. If the milk is thick, inject a small quantity of solution of common baking soda, or saleratus, into the udder, and after a few minutes milk it out.

ABORTION.

When a pregnant animal expels the fetus before it has become sufficiently developed to live outside and separated from the parent, abortion (partus immaturus, or immature birth) is said to occur. When the birth occurs before the due period, but with its

organs sufficiently matured for the perfect operation of the vital functions, it is partus prematurus, or premature birth. The former occurrence is a disease, the latter simply an accidental shortening of the normal period of the inter-uterinal growth and existence of the fetus. In practice these two conditions differ only in the result. Abortion is the birth of an immature fetus which is dead, or too weak and ill-formed to live. A premature birth results in a weak animal which may live and thrive or succumb and perish, in a short time. It is frequently the case that an animal prematurely born may by good management survive and become as profitable as one that has passed its full time.

The sheep, and the goat—a closely-related species—are most liable to this accident of all the smaller domestic animals; but not nearly so as the cow. The cow averages 20 per cent of abortions, the sheep, among nearly 6,000 recorded births, suffered 26 abortions or about 4 per cent only.

Abortion occurs in the sheep and goat generally twenty days or more before the due period, or the 140th day after fecundation. The nearer this limit the more serious the risk of the dam is.

Abortion is sporadic, that is, occurs here or there over a wide extent; or it is epizootic, and occurs numerously in any special and distinct locality.

The former occurrence may be due to an unfavorable season in which the ewes suffer unusual hardships, mostly deficiency of food or sudden unfavorable conditions of the weather. Dry cold is not so mischievous as wet, cold weather; and frosty nights following warm days, or perhaps more accurately the reverse, is the most frequent of all accidents. Pasturing on the frosty herbage in such a condition of weather so chills the womb by contact with the cold stomach, as to produce this disorder more frequently than any other cause. As prevention is the only remedy for this disease, it is the business of the shepherd to exercise caution in this regard. Another frequent cause of abortion is overloading the stomach with coarse, innutritious, indigestible fodder; in fact the stomach is so closely connected with the uterus, that a sympathy between these two organs exists which is to be well considered by the shepherd, and the feeding is to be so managed that indigestion, and especially bloating of the stomach, is to be avoided. It also goes without saying that the food of a pregnant ewe is to be sufficiently nutritious and well balanced to supply all the needs of the ewe and the fetus within her.

Certain foods, too, are to be avoided. These are the coarse sedges and weeds growing on low lands; the aromatic ragweed and allied plants which contain a similar essential oil to which the strong odor is due; the leaves of turnips in a frozen condition, and the leaves of the beet in any condition are all liable to cause abortion, or so alleged by several noteworthy authorities.

Dogs are the most serious cause of this disease by chasing or injuring the ewes during the latter part of the pregnancy. Fright, probably by its injurious action on the nervous system, as well as the violent physical exertion, conspire to produce this

result. All these instances go to suggest such precautions as will insure immunity from this form of the disease.

One special instance should not be omitted, which is the effect of some natural influence or defect of the ram. For instance, over use, having too many ewes to serve; too early an age and consequent inability; and a defective constitution; all go to produce essential weakness of the fetus; which, as it approaches the end of the fetal period, has not sufficient strength to mature, and thus dies and is ejected.

There are no premonitory symptoms in this form of the disease. Abortion may occur suddenly and usually does, so that the fetus is lost without the knowledge of the shepherd. It happens mostly in the night, and the appearance of the aborted fetus in the pasture or the pens, is the only indication to the shepherd that some ewe has gone wrong, but which he will probably never discover. The results on the ewe are rarely noticeable and of course any treatment whatever is out of the question, unless the ewe may be found suffering from bleeding or prostration through sympathetic action of the nervous system. In this case a dose of two drams of laudanum may be given with good results.

Epizootic abortion is due to contagion. It may appear suddenly in one flock and in a short time be active in many others at the same time throughout an extensive locality. In this form the disease is always due to the presence of a certain germ allied to the common molds—*Pencillium glaucum*—the common green mold or mildew, possibly originating in the field. This germ spreads from the ejected matter of one animal to the related parts of others, and thus disease spreads rapidly through a flock and from one to another in various ways. The treatment is to carefully disinfect the ewes by injecting one or two ounces solution of carbolic acid, twenty drops of the acid to the ounce of water, twice in the day. Two ounces of infusion of black hair (*viturnum prompolium*) in hot water, may be given when cooled down to the ewes which gives indications of aborting, or to all of them in the flock as a safe precaution.

As a preventive, the condition of the ewes is to be maintained during pregnancy by good food, carefully avoiding ergotted grain or hay, or smutty corn or oats, together with straw or fodder from crops that have been infected by smut. Pure water, free from all marshy drainage, only should be given to the flock.

COMMON DISEASES OF SHEEP.

ANEMIA—PAPER SKIN--THROAT THREAD WORMS.

This disease affects lambs mostly, and is recognized by the white and bloodless appearance of the skin; the general weakness of the young animals, and cough which has a rattling sound, in consequence of which the weakened lambs are able to breathe only with difficulty. The disease is due to the presence in the throat, and air passages of the lungs, of a small white worm, slender and

almost invisible in the mass of frothy mucus in which they are gathered in clusters. This worm is known as *Strongylus Filaria*.

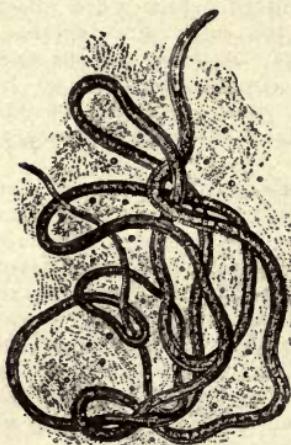


FIG. 1.—Lung Worm.

The disease is immediately recognized by severe coughing fits of the infested animals, mostly lambs under a year old. The difficulty in breathing necessarily prevents the due aeration and purification of the blood as it passes through the capillaries of the lungs, to be refreshed by the pure air breathed. The red corpuscles of the blood are greatly decreased in number, and as these are necessary to the full development of the body the affected lamb languishes, becomes weak, the blood is reduced to a yellow serum without vitality, and all the visible membranes are pale, and the skin has the appearance of paper. Hence the common name of this disease.

The treatment depends on the destruction of the parasite. This is most easily affected by the use of turpentine, continued until the system is saturated with it and the fumes escape through the lungs and throat. Here the volatile oil comes in contact with the parasite and kills it, thus relieving the suffering animal most effectively. As soon as relief is afforded in this way, the most easily digested and nutritious food, as linseed meal, with oatmeal and bran, is to be given daily, in moderate quantities to insure full digestion. The turpentine is most easily given in sweet milk, the two shaken together to form an emulsion. The quantity is one teaspoonful given in the morning before eating, and repeated daily for a week.

These worms are believed to gain access to the lambs with the grass of the pastures, and it is believed—doubtless with ample reason—that, as the old sheep are equally affected by this parasite, this is ejected by them either by coughing or through the bowels, and falling on the grass they, or the eggs of them, are taken up by the lambs feeding with the ewes. To avoid this infection, lambs should never be permitted to pasture with the ewes, and the meadows should be liberally dressed with fresh air slaked lime every Spring or Fall.

As a help to restore the condition of the lambs give each one a half teaspoonful of a mixture of gentian, ginger and sulphate of iron, a most useful tonic mixture, which will hereafter in this chapter be termed the tonic mixture. These ingredients are finely powdered and mixed, and one teaspoonful is a dose for a full-grown sheep. It is easily given in some ground feed or with molasses spread on the back of the tongue.

TAPE WORMS.

This class of animal parasites are all of the greatest interest to the scientific student on account of the peculiarity of their habits. They doubtless cause more ailments of all kinds, some quite unsuspected as the results of the special cause, than any other similar cause of diseases. The sheep is unusually exposed to this class of parasites and on account of the curious life history of them while passing through the sheep the sheep suffer more from them than from any other cause of disease.

TENIA MARGINATA.

Tenia marginata is the name of one of the most common of these parasites. This name, derived from the Latin, means in plain English, the marginated or bordered ribbon worm. This indicates the figure of the mature worm, which as seen in the illustration, is a long slender ribbon-formed thing, with a corrugated border or margin. It reaches a length when mature of no less than eight feet and a width of nearly half an inch. In this form it inhabits the intestines of the dog. Thus at the start we find that the dog or some other animal related to it, is necessary to the perfection of the life history of this creature. The illustration given shows the general figure of this worm in its adult stage. The slender part, (a) is the head, shown enlarged at (b, b,) the body increasing in size and in length of section or segments to the end (d, d,) from which the segments are shed as they mature (e, c and d,) filled with eggs. These segments are voided by the dog or other bearer and if on the grass of a pasture, or near water, it is a foregone conclusion that the sheep must some time or other, in the list of chances, pick up some of these eggs, when the infection begins.

In the sheep, the egg soon transforms into a young worm which is enclosed in a cyst or bladder, the end of the neck of which is the head of the worm. The cysts mostly inhabit the liver of the sheep, but have been found in the heart, lungs, and muscles. To reach these resting places the minute eggs or embryos must penetrate the wall of the sheep's stomach, and enter the minute capillary veins from which they easily pass through the larger veins into the liver or other resting places, where they remain until they either kill the host, or die for want of the means of development. In the former case the sheep perishes of the disease set up in the liver by the irritating presence of the parasite, or the disease may exist in the abdomen in the form of peritonitis. When the dead sheep is in the course of nature made a prey to the dog, the wolf or the coyote, the cysts containing the eggs are swallowed, and at once begin their final development into the mature worm.

It is readily seen that this disease due to this parasite must be deadly to the sheep, which is the common result; or the parasite is no longer troublesome except so far as regards the permanent encystment of the living or dead embryo in the muscles,

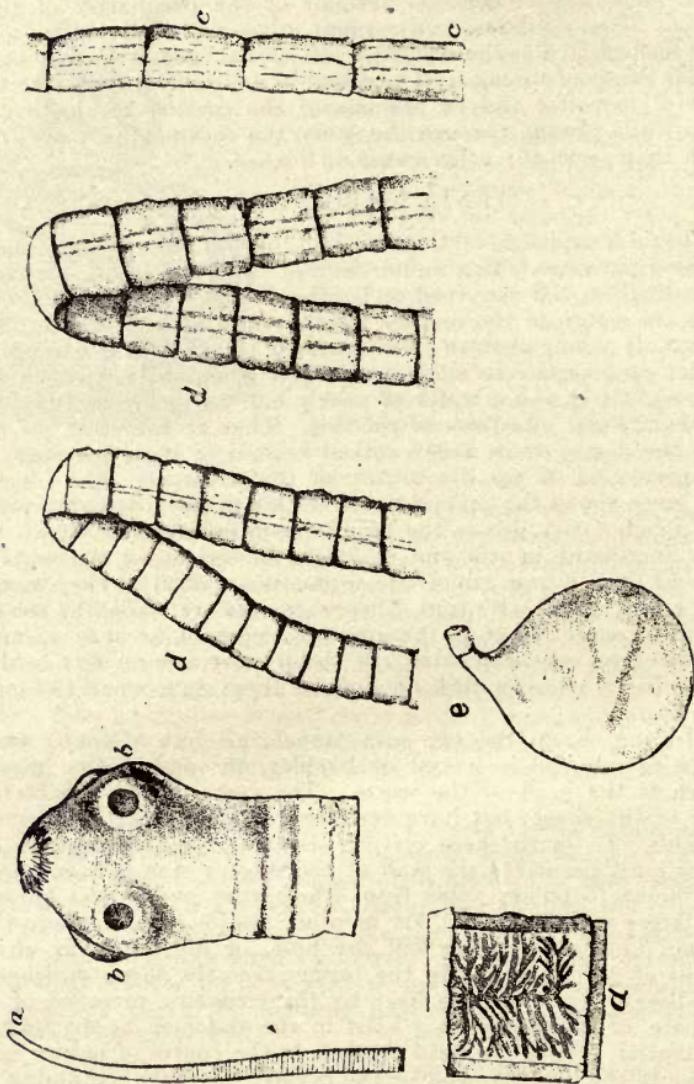


FIG. 2.—*TENIA MARGINATA*.
 a, Head; bb, Head Enlarged; c, Mature Segments; dd, Same Enlarged; e, Cystic Form or Bladder.

or whatever internal organ the cyst may have lodged in. If this occurs the remains of the parasite will be marked by a limy deposit at the spot where it perished. But there exists this danger. If the embryos become encysted in the muscles of any animal whose flesh is used as food, and the embryos are still living, those persons who may eat the meat of such animals, and which has not been sufficiently cooked, will become infected; as is so frequently the case among persons who consume their food half cooked, or not cooked at all. This does actually occur to an enormous extent among half civilized peoples. Dry mutton hams may thus infect persons who eat them. In this cystic form the parasite is known as *Cysticercus tenui-collis*, or the slender-necked, round cysted worm.

If the worm is to be attacked at all it should be in the dog. This is an easy method, for by administering the proper antidote at regular intervals of two months, the worms may be destroyed and the sheep delivered from the danger so far. As another tape worm of the sheep inhabits the dog and its term is nearly a month, the safe way would be to give the medicine every twenty days, thus covering the intervals of each of these parasites. Areca nut is the most effective remedy for this use. The freshly ground powder, in quantity equal to two grains for each pound of live weight of the dog, may be given with butter or in any other convenient and simple way. The dog should go unfed from noon the previous day and until a few hours after the medicine is given. Two hours after giving the medicine, give one ounce of castor oil. Keep the dog tied up until the medicine has operated, and the dead worms have been passed. Any other effective substitute may be used if the desired effect is gained.

TENIA COENURUS.—GID OR STAGGERS IN SHEEP.

This species of tape worm is the cause of that well known and frequent disease of sheep called Gid, Turn-sick or Staggers.

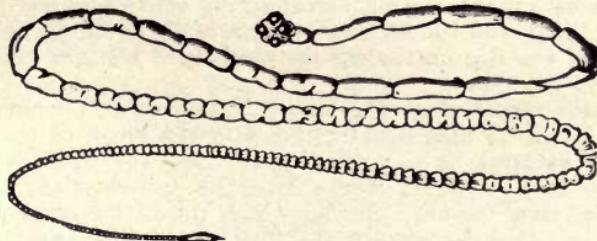


FIG. 3.—Adult, Natural Size.

It is so named because the animal under the influence of the disease becomes giddy and is compelled by a well known function of the brain, to turn to this or the other side, as it moves, impelled thereto by the influence of the pressure on either half of the brain as the case may be. It is well known that each half of the brain exercises its function on that special side of the animal, and thus the pressure of the watery bladders, in which the embryos of this

worm are contained, on the substance of the brain, causes this special result. The sheep turns round and round in small circles, staggers, trembles, stops eating and drinking, is convulsed and finally dies of paralysis or exhaustion. If the head is examined

there will be found these cysts, drawings of which are taken from Cobbold's Treatise on Internal Parasites. These may contain many of the immature worms, scores or hundreds, attached to the inner surface of the bladder. It is the pressure of these watery bladders, on the substance of the brain, by which the abnormal movements of the sheep are caused.

Sheep become infected through the pasture on which they feed, and on which the eggs of the worm may have been dropped by dogs in their dung, or from water in which the eggs may have been washed or deposited in any of the many ways possible.

Fig. 4.—Upper Surface of the Brain, showing at (a) the Coenurus cerebralis cyst.

These eggs are taken of course into the sheep's stomach, and there hatching, they make their way by migration into several parts of the body, the eggs doubtless gaining access to the veins are thus distributed, but perish wherever deposited, except in the brain. Once there, the worms begin a migratory expedition in search of a resting place, making galleries through the brain substance, until they grow too large, when they form a large cyst or bladder in which they remain as above mentioned. In time, the sheep so infested dies, or is slaughtered, when the head, thrown to the dogs, is eaten and these embryos are swallowed. The history of the worms described in the preceding pages is then repeated, and the segment or eggs of them mature in the intestines of the dog until they are discharged and are taken once more into the sheep.

In this larval stage the worm is known as *Coenurus cerebralis*. After its first introduction into the brain of its host, it is about as large as a mustard seed, and the disease becomes manifest in five or six weeks after its introduction. It then grows for some months, during which its effects are constantly increasing in virulence until the final symptoms appear and the death of the sheep follows.

The first symptoms of the disease noticed are dullness, feebleness, heat in the head, redness of the eyes, and hastened circulation. The head suffers visibly, being stretched out, turned back, or carried drooping. Then follow spasmoid convulsions or paralysis. During these manifestations of pain and distress, the sheep makes those typical movements, turning in circles towards the side of the head affected most, or if the parasite is in the cen-



ter of the brain, going forwards, pressing the head against a wall or gate or fence, and standing stupidly. Death may then occur in a few days or the sheep may appear to recover for a few months when a different attack will occur. Two per cent is the average of recoveries from these attacks. It has happened that this worm selects, or is forced so to do, the spinal cord for its resting place. Then the sheep walk with a staggering gait, and inflammation along the spine with all the symptoms of myelitis occurs. There is little hope for cure by any of the alleged operations that have been reported, such as piercing the skull with a sharp-pointed syringe, and drawing off the serum from the bladders, when the worms will die, and the offending matter will be absorbed without serious results. These alleged successful operations are doubtless the vain stories of shepherds, who were not sure of the disease ever existing. The skull may be punctured and the brain operated on, and water may exist in the cavity of the skull with some such manifestations as in this peculiar disease. And this is doubtless the explanation of these alleged cures of this complaint.

The only cure is prevention by ridding the dogs of the tape worms, by slaughtering the affected sheep at the early stage of the disease, and carefully destroying the head and its contents. A sheep in good condition may be used for food without risk when thus disposed of.

TAEÑIA ECHINOCOCCUS HYDATIDS.

This worm is known as the many headed tape worm. As it is not existing in this part of the world, it is merely mentioned so far as to say that its seat is in the liver and the lungs, and its history and the methods of prevention are the same as those described in the two above sections. The same applies to

TENIA TENALLA, THE MUTTON MEASLE.

This worm exists in the loin muscles of the sheep, forming white spots as large as flaxseed in the meat. It is only noticed to any considerable extent in Eastern Europe.

TENIA FIMBRIATA.—THE GALL-DUCT TAPE WORM.

FRINGED TAPE WORM.

This worm is distinctly an American pest. Its alleged native home was in Brazil. Its common name is the fringed tape worm. It reaches about one foot in length, and about a quarter of an inch in width. It is found in the duodenum, the large bowel next to the stomach, and also in the gall ducts. A large number of them have been found at one examination in the duodenum, sometimes amounting to a hundred. Usually from two to thirty are found. When found in a flock nearly every sheep will be infested. It exists so abundantly on the Western plains as to cause greater losses than from any other parasites. It has been found in flocks in Utah, Colorado, Nebraska and westward to the

Pacific. It has been found in deer killed in many parts of these Western localities, and the author has identified it in several specimens sent to him mostly from Arizona and New Mexico, from both deer and sheep.

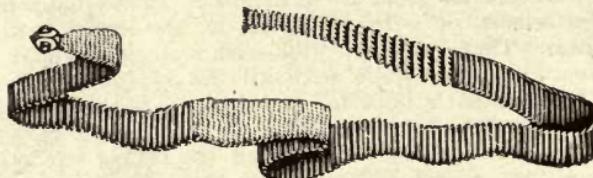


FIG. 5.—Adult, Natural Size.



Side View
of Head.



End View
of Head.



Segments
near Head.

The illustrations, fig. 5, show the special character of this tape worm, with the fringed edges, of the segments. Its form is lanceolate in its contracted state, but linear when extended. When contracted, the fringes being drawn closely together appear like plush. The shedding of the fertile segments begins early in life and continues until death. The head is provided with four cup-like suckers.

These worms are found in sheep during the whole year, but none in lambs under ten months old. It seems that the breeding locality is the duodenum, as worms less than one-tenth of an inch in length have been found in it, when the gall ducts were entirely filled. The manner of reproduction is by the separation of the final segments as in other tape worms. At two months age the worms are about half an inch in length, in four months the worm has grown to five inches in length, at which time they begin to affect the condition of the infected sheep. This effect is to stop, or dwarf, the growth; reduce fat lambs to skeletons, thin, hidebound, and dwarfed, with little wool, and that weak and tender in the fiber.

The lambs show the first indications of the disease by their gradual loss of condition. A desire to eat coarse, indigestible food, a depraved appetite in fact, is one of the first evidences of infection. Thus the sheep have been found to eat large quantities of the so-called loco or crazy weeds of the plains, but more correctly the two plants known by this name, but correctly as *Astragalus mollissimus*, and a closely related other plant, a species of *Oxytropis*. These are well known to the stockmen of the Western plains, as being injurious to horses and cattle and as well to sheep.

The disturbance of the digestive functions by this interference with the circulation and distribution of the bile is general in its effect. The digestive process is incomplete, and the food does not nourish. Hence the result is starvation to such a degree as these functions are impaired. All the symptoms, the staggering gait, loss of fat and leanness, the watery effusions, and the foolish conduct noted, are attributable to this defective nourishment of the animal, and the weakening of the functions of the brain. So far all professional treatment has been at fault, unless it may be said that the proprietary vermicifuges and tonics in use have been found most useful. The manner of life of this parasite should indicate to the veterinary the use of such diffusive remedies as turpentine podophyllin, taraxacum, and sulphate of iron, or other remedies having special action on the functions of the liver, and that are absorbed into the blood, and so pass through the liver in a most effective condition. It is all the more reasonable that the professional practitioner should adopt some of the methods of the specific compounders, and not think of these as quacks as long as their remedies succeed, while they themselves fail disastrously to cope with this deadly tribe of parasites.

As with all parasitic diseases it is the weak that go to the wall. To sustain the strength, to get the lambs past the fatal stage, is to be the effort of the shepherd. Thus good feeding from the start, pure water infallibly supplied, to avoid a season of Winter starvation, to provide shelter in bad weather, in fact for the shepherd to do as he would wish to be done by, were he to change places with his flock, should be the rule. If it costs a little more to save a sheep than to let it die miserably in the Spring, after having been fed for the whole Winter, the cost is returned with some profit, while a dead sheep is a profitless property.

THE BROAD TAPE WORM OF SHEEP—*TENIA EXPANSA*.

This is the most conspicuous of all the tape worms on account of its comparatively enormous size. Its length reaches about 16 feet, and European writers allege that it has been found considerably exceeding this, even up to scores of feet; the maximum of the fertile imagination of some alleged observers mounting up to 90 or 100 feet. These writers, it may be observed, are natives of the country of the noted story teller, the Baron Munchausen, whose observations, as narrated by him, certainly tax the wildest credulity. We may reasonably rest on our own observations, and on the comparatively gigantic size of our own worms, and stop at the moderate length of five yards or about one-third of the length of the whole of the intestinal canal of the sheep. It is flat and thin, being about one-tenth of an inch in thickness, and in width from one-twenty-fifth of an inch at the head to three-fourths of an inch at the other end, from which the fertile segments separate as in other tape worms. The head is larger than the smallest part of the neck, and about as large as the head of

the smallest pin. Its body is made up of very short but wide joints, increasing in width from the head to the other extremity, at which, as with other tape worms, the mature segments separate and pass out of the intestines.

These worms have no alimentary canal, but absorb their nutriment through the surface of the segments. The embryos exist in the mature segments. They are too small to be apparent to the sight. Each of them is provided with hooks by which they attach themselves to the coats of the intestines. The worms are found all over the United States, and are at work in every month in the year. In the Spring and Fall, Summer and Winter, they have been found in the intestines of lambs slaughtered at the abattoirs. They are more abundant in some localities than in others, and in the Summer than in the Winter. Overfed and bare pastures are the most prolific sources of infection, by which it is apparent that the segments ejected from the bowels, and falling on the ground, are in some way picked up by the lambs and become matured in their intestines. There is no intermediate bearer of this parasite.

The growth of the young worms is very rapid. They have been found two to five yards long in lambs two to four months old, which is equivalent to a foot to two feet of growth in a week. All the knowledge possessed by careful investigators goes to prove beyond question that this worm does not pass any stage of its existence in the bodies of any other animals of any kind than the sheep, and its life history is thus simple and devoid of the interest in this regard attaching to other tape worms.

The existence of the worms becomes evident by the appearance of the white segments attached to the small balls of dung voided by the sheep, or by these adhering to the wool about the top of the tail. This, however, only happens after the lamb has been infested some time and the segments of the tape worms have become matured. The worst results to the sheep by the presence of these worms seem to be due to the intestinal irritation set up by them, and the reflex action of this on the nervous system. But the worms obstruct the intestines as well by their large size, irritate it by their movements, produce excessive intestinal secretions, non-assimilation of food, and as well abstract nutritious matter from their victims for their own growth. The results are necessarily the wasting of the lambs which become poor, unthrifty, and hidebound, and frequently pot bellied by distension from gas in the bowels, or shrunken and gaunt for want of sufficient support.

The symptoms in addition to these are pale membranes (paper skin), dry, harsh fleece without yolk or oil, a tottering gait, and the lambs eat and drink more than with their natural appetite, but at the same time fail to digest their food or thrive upon it. Finally diarrhea becomes more and more severe and death occurs by actual starvation and exhaustion.

If, however, the lambs can be safely carried over until the worms are all ejected as segments, and no fresh infection occurs, recovery is rapid and the lambs soon become fat and thrifty.

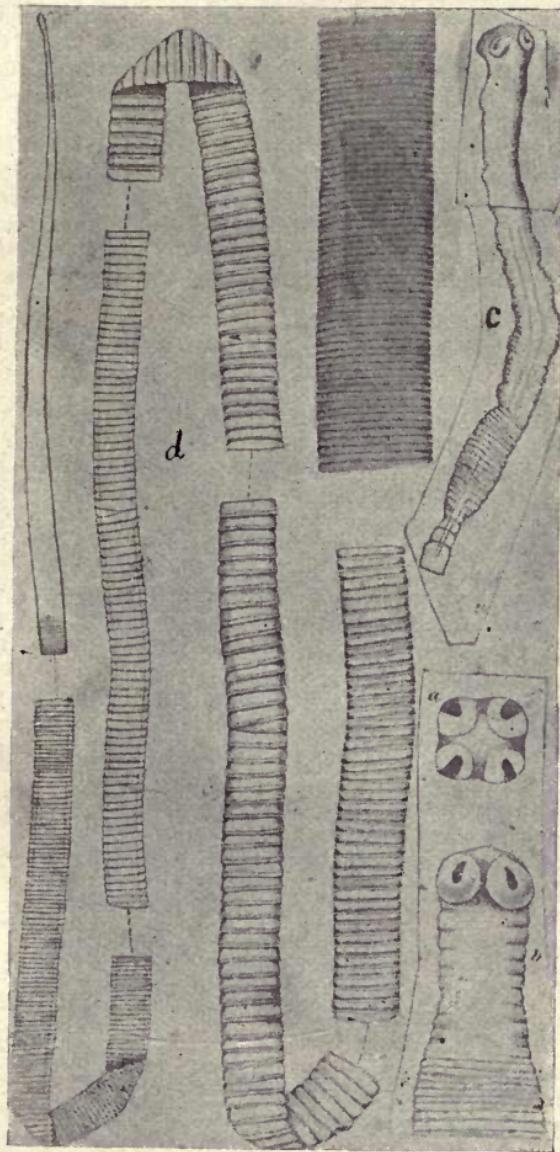


FIG. 6.—*TENIA EXPANSA*.
a, End view of head; *b*, Side view of head and neck; *c*, In a young stage; *d*, Sections of adult worm slightly reduced.

As these worms are readily expelled and always within reach by effective antidotes, treatment is always hopeful. The popular remedies in the market prepared by experts and well endorsed by known persons, may generally be relied upon; and by following directions have been found effective. Outside of these the use of turpentine, in half ounce doses on the empty stomach for a few days; the roots of the male fern powdered in two ounce doses; or the etheric oil of the root in one dram doses, given in two to four ounces of castor oil for a full grown sheep have all been found more or less effective. Tansy in two to six dram doses has been recommended as a preventative, and is a useful ingredient in some of the proprietary worm powders. Regular use of salt with the standard tonic mixture given on page 314 of this chapter has been found a valuable element of safety in the way of prevention against this pest.

THE STOMACH ROUND WORMS—*STRONGYLUS CON-TORTUS*—THE TWISTED STRONGYLE.

The twisted strongyle inhabits the fourth stomach of the sheep and the goat. It is by no means a serious pest except in the flocks that are neglected and in poor condition, and unable to resist misfortune. It is from five to ten inches in length (the male is one-third shorter), has a reddish-colored body, and the female is marked with a spiral double line entwining the whole length of it. It is also found twisted in loops, whence the name *contortus*. They live their whole life in the fourth stomach, in which they set up serious irritation, besides greatly interfering with the nutrition of the sheep and the abstraction of blood from the coats of the stomach. Their red color is supposed to be due to the blood thus drawn. The symptoms arising from the presence of this parasite in the stomach are weakness, paleness of the skin and membranes, some fever, diarrhea, and wasting of the body generally.

This stomach worm, like the common throat and lung strongyle, has no other host than the sheep, passing its life in the stomach, its eggs or mature body filled with eggs being ejected with the dung of the old sheep which are able to resist its effects better than the weaker lambs, and these eggs are taken up with the grass of pastures by the lambs. It is quite possible that the young lambs may be infested directly by the sheep, whose tag locks on the hind parts—smeared with dung—may have many of the eggs of these worms on them, and these being sometimes sucked by the young lambs hunting ignorantly for the teats, become means of infection. That sucking lambs are infested by these worms can hardly be explained otherwise.

The presence of these worms in the lambs cannot be surely known except by examination after death, although the symptoms are fairly well sufficient for a diagnosis by the veterinarian. The most successful treatment known to the author has been by small, frequent doses of turpentine in milk, in the proportion of one part of the former to eight or ten of the latter, and two ounces

or tablespoonfuls being a dose for a lamb half grown. A standard preparation for this disease is made up as follows: Three pounds of salt and half a pound of saltpeter, are dissolved in three gallons of warm water, and half a pound of ground ginger is then well infused in the liquid, kept warm for a few hours. When it has cooled to milk warm, 24 ounces of turpentine is added, and the whole well shaken. Two ounces is a dose for one lamb. Along with this medicine, given on an empty stomach early in the morning, the standard tonic mixture should be given alternately. As with all diseases of this kind the most nutritious and easily digestible food is required, as linseed and oatmeal mashes, the best hay and some sliced carrots or parsnips for the winter feeding, and good clover pasture in the Summer.

INTESTINAL ROUND WORMS.

American sheep harbor at least six species of round worms, all of them imported from Europe, and one which is native to this continent. These various species are:

Strongylus Filicollis, *Strongylus Ventricousus*, found in the duodenum; *Dochmias cornus*, *Ascaris lumbricoides*, found in the small intestine; *Tricocephalus affinis*, found in the caecum or blind gut; *Selorostoma hypostomum*, found in the large intestine; *Oesophagostoma Columbianum*, found in the large intestine.

None of these are of any serious importance except the last, which is widely spread, and causes such a conspicuous injury to the intestines as to have been given a special name, knotty guts, by the butchers.

The symptoms produced by all or any of these worms are general debility, indigestion, and resulting emaciation. These are the results of absence of nutrition due to the interference with the digestive functions, by reason of the constant irritation of the bowels. It is mostly the case that a sheep or lamb is infected by more than one of these parasites at once, and in many instances it has been found that several of them are harbored by the sheep together. It seems as if every sheep is infested less or more, and even those in the best condition and the fattest that come into the butchers' hands, have a few of these parasites, and some so many that it is a matter of surprise that the sheep could maintain their high condition.

As a matter of interest these parasites are described, but treatment is so difficult and there are so many other causes by which the special symptoms may be produced, that it is better for all concerned to study the means of prevention rather than those of improbable cures.

It is known that sheep may become infected with at least one of this kind of worms through the swine with whom they may be pastured. Thus the large, round worm, *Ascaris Lumbricoides*, has been found in sheep although it is a specific parasite for swine. It is also known that pastures become seriously infected by several kinds of worms that are found in sheep, and the investigations of the scientific students have shown conclusively that it is

in this way that the majority of sheep and lambs become diseased. To dress the pastures with fresh, air-slaked lime in the season when the flocks are not pasturing is an excellent preventive against all this class of parasites, and the regular culture of the land, the plowing and the growing of crops in the regular rotation; the completion of which is the seeding of the land with grass and clover, will both be a help to the farmer who keeps sheep, but of course of no avail to those who range their sheep. These must depend on those medicinal preparations made for this special purpose of avoiding these parasites, or tonic mixtures by which the natural strength and vitality of the sheep may be maintained, for it is the feeble and the ill-nourished that fall as an easy prey to these parasites.

OESOPHAGOSTOMA COLUMBIANUM—NODULAR DISEASE OF THE INTESTINES—KNOTTY GUTS.

It is only in recent years that this parasite has been known as the cause of the disease commonly named above. Less than

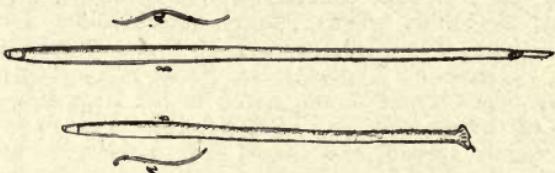


FIG. 7.—*a, a*, Male and female, natural size; *b, b*, Male and female, enlarged. (After Haines.)

ten years ago it was discovered in some investigations as to the nature of the knots or small tumors with which the intestines of the sheep were more or less covered. This investigation curiously enough arose from the connection of the sheep's intestines with sausages. These sausage casings, of course should be perfect, and above suspicion, however open to this the contents of them might be. The common nodules by which these skins were more or less unfitted for this use, made them unsalable, and a loss to the butchers. And thus the matter became a subject of investigation with the result of discovering that the disease was due to a hitherto unknown parasite of the sheep.

The cause of this disease is a round worm, and one entirely distinct from any other known species. The male is about half an inch in length, the female a little longer. The head of it is bent into somewhat the form of a hook. In the sheep the adult worms live in the large intestine, the young ones are found in all parts of the bowels encysted in small tumors, at first no larger than the head of a pin, filled with a sort of cheesy matter. How the parasite enters the sheep there has been no satisfactory information gained so far; so that we have to deal with these facts. First these nodular swellings or tumors are found on the inner walls of the intestines. Of course as the walls of the intestines are the absorbent organs by which the digested food is taken into the

circulation to be completely fitted for the support of life, whatever interferes with this function is a cause of serious disease, tending to deprive the animal of its due support, and thus producing general want of nutrition and resulting weakness. This is precisely the result of this parasite and is so far operative as its effect on the bowels may be.

The symptoms of this disease are signs of general weakness, paleness of the lips and eyes, thin pale skin, loss of flesh, dry, harsh fleece, and more or less diarrhea which soon produces marked emaciation. These results are very gradual and slow in their course, the sheep or lamb seems to be not doing well, but the advance of the disease and the continuous change for the worse occurs so gradually that the shepherd scarcely realizes the extent of the injury until the more serious symptoms occur. A persistent diarrhea is the most marked characteristic of the disease.

The tumors increase in size as the worm within grows. In time the worms escape and remain loose in the intestines, there becoming full grown and reproducing their kind. Not all the young worms are thus encysted in these tumors, but only as it were a sufficient number to insure the continuance of the race, should by some accident the worms at large be destroyed. Considering this fact on the general knowledge and experience with other parasites it might be well supposed and believed that this encystment of a portion of the race should be one of the means by which nature provided for the continuance of life, of whatever form it may be, and that in case the sheep died from the effects of the parasite, there should be a remnant left—as we say—for seed; and by the intervention of some intermediate bearer the parasite might have its life insured, so to say, that the race might not be completely extinguished.

Treatment in such conditions as these is evidently a difficult matter to suggest. For the worms that are loose in the bowels the common antidotes might be useful, such as turpentine, given in the usual manner, or other medicines destructive to these creatures. These combined with tonics and with general good care and feeding, with pure water, may tide over the period of life of the race or make the animal an uninviting place for the parasite to live. As to the encysted worms, these are beyond reach unless it may be of such easily absorbed remedies as turpentine, which passes through the blood and thus reaches every part of the system.

It is clear that such methods of prevention as may be found effective will be the most useful. And one of the most effective of these is a rotation of crops, and short feeding intervals between the crops not exceeding one season at the most. If one might be able to start with a flock of completely unaffected sheep, and then by a wise and thoroughly managed continuous quarantine, so to speak, by which infection may be averted, then the land may be completely freed from this obnoxious parasite, and if this method were generally followed, and no fresh stock be intro-

duced until it be known to be sound and free from infection, then, and then only, will this parasite be brought under control. As it is, by the how-not-to-do-it method, this as all other of the parasites of the sheep are visibly increasing in vast numbers, and thus as we may say we are but at the beginning of a

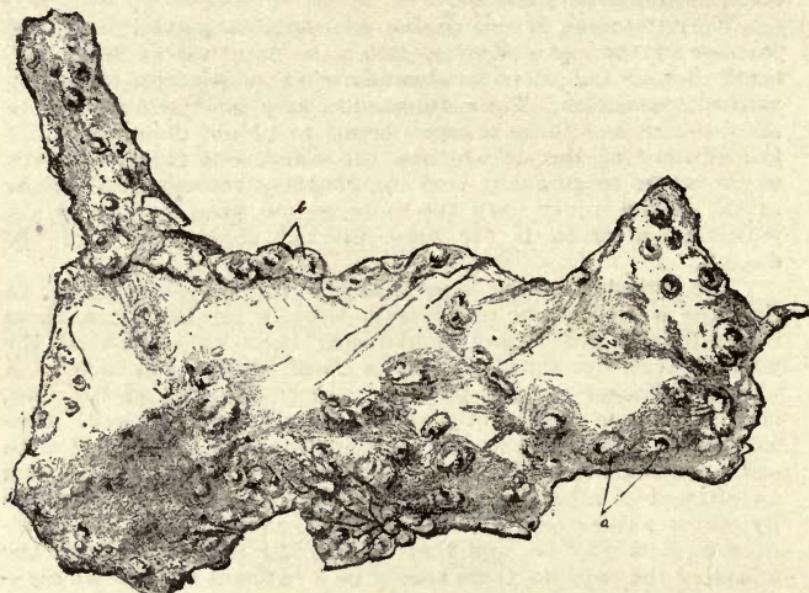


FIG. 8.—*ŒSOPHAGOSTOMA COLUMBIANUM.*

Caecum showing wall filled with Nodules as seen at *a* and *b*. About one-half natural size. (Original.)

crisis of what the end may be no one can think, or assert, but every one may consider it as a serious matter for thought and then due action. The importance of this great and most ancient industry of our race cannot surely be seriously threatened in these days of intelligence and of scientific adaptation of means to ends through all the affairs of mankind. We must always think of that truly scientific maxim, an axiom truly, that is an self-evident truth, that the fittest only will survive. And the American shepherd must make himself fit by study of his flocks, knowing their full needs, and in all the ways that circumstances may indicate and suggest, adapt everything to this one end, viz., to make himself thoroughly conversant with the needs of his flocks, and then apply himself with every possible effort to meet these most effectively.

THE FLUKE DISEASES OF SHEEP.

Among other deadly parasites of sheep the so-called fluke worms, known as *Fasciola hepatica* and *Distoma lanceolatum* are the deadliest. They have been known to destroy two million sheep in England in a single year, and several years ago the same

parasites destroyed several times as many in Australia. Unfortunately we have it with us, but not nearly to the same extent; probably because of the much smaller proportion of sheep to our vastly greater territory. The history of this parasite is quite similar to that of other injurious enemies of the sheep—as the tape worms for instance—in that it needs an intermediate bearer in

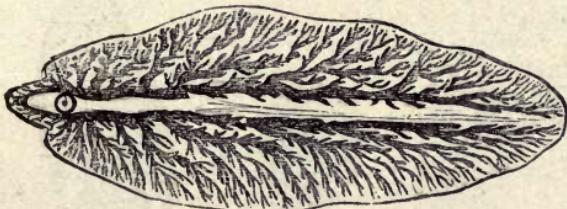


FIG. 9.—Mature Fluke.

which to pass the first stage of its existence. This is a mollusk, a species of snail, which inhabits fresh water marshes. The curious history of this parasite is of great interest to the American shepherd, because we have the bearer of it here and the creature itself. It is comparatively abundant in the marshes of the Northwest and has been found in the States of New York and Pennsylvania. In the former locality it has been found in the livers of deer and rabbits; and in rabbits in Pennsylvania. It has also been found

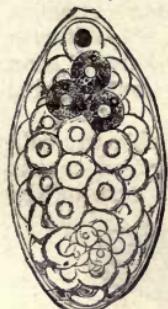


FIG. 10.
The Fluke Egg.



FIG. 11.
Egg with Embryo.



FIG. 12.
The Embryo.



FIG. 13.
Snail Enlarged.

in the flock of Southdowns owned by the late Royal Phelps, on Long Island, N. Y.; but in this case the parasite was unquestionably imported in the sheep, which were Southdowns presented to Mr. Phelps by an English friend. This introduction of the pest was doubtless successful in establishing it in that locality; as three years had elapsed since the sheep had been imported.

The mollusk in which the fluke passes its larval stage is a snail, but it is not that the sheep devour the snails, and so take up the parasite, but the young of the fluke are taken up by the sheep as they drink at stagnant ponds or water holes in marshy ground, where in an intermediate stage they pass a portion of their existence. Then, finding their way from the stomach, to the liver,

they enter the gall bladder and its connected ducts, where they create such a serious functional disturbance as to cause an overflow of the bile into the blood, by which parts of the body—the eyes, skin and fat—become yellow, and a yellow serum collects in the abdomen, causing the diseased sheep to appear “pot-

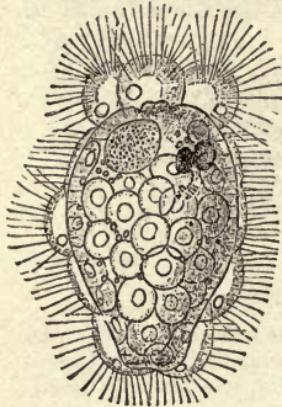


FIG. 14.
A Sporocyst.

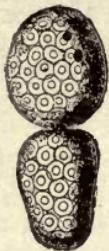


FIG. 15.
A Mature and Dividing Sporocyst.



FIG. 16.
A Cercaria.

bellied.” At first the sheep appear to thrive better than usual and rapidly make fat, which, however, is yellowish in color. Very soon the characteristic dropsy appears, a bag of fluid forms under the jaws, severe diarrhea occurs, and the animal soon becomes emaciated and perishes miserably by a slow wasting until completely exhausted.

As the fluke does not inhabit salt water, salt marshes are safe pasture grounds; but it does not follow that salt given to the sheep is any sort of preventive or remedy. In fact, cure of the



FIG. 17.—Young and Mature Redia.

disease is very rare, and only by the aid of accidental causes, so that this disease, is a true pestilence, killing nearly every sheep attacked, and it is only by due means of prevention that it is possible to avoid it. These are the drainage of wet pastures, the use of pure water from wells, and to put imported sheep through a sufficient course of quarantine; carefully burning all the manure made by them so as to destroy any possible source of infesting the land.

ILLUSTRATIONS DESCRIBED IN DETAIL.

Fig. 9.—Mature fluke—flesh color, one inch to one and one-third inches long. Circle at top is sucker that attaches to diseased part. Mature fluke produces as many as 7,000,000 eggs. Fig. 10 is fluke's egg, oval with transparent shell. An embryo forms in two weeks when temperature is 80 degrees. Fig. 11, egg with embryo formed. Fig. 12, embryo hatched. The broad end is directed forward in swimming, in its center is a peg-like projection used in boring. If embryo finds the *Limnoeus truncatulus* (fig. 13) it commences to bore. It bores until it strikes the snail's lung where the embryo fluke develops. The form of embryo changes to fig. 14—the 1st generation in the snail termed sporocyst—a bag of germs. This sporocyst develops an offspring, their 2nd generation called the redia. Fig. 15 is a matured sporocyst containing a number of redia. The largest one at lower end is well developed and ready to force through the walls of the parent—the wound heals up and germs remaining continue to grow. The redia go from the lung to the other organs of the snail. Fig. 16 is a full grown redia with a mouth and intestine and produces the 3rd generation. The offspring of the redia (fig. 17) are tad-pole shaped and called cercaria. This 3rd generation of the snail enters the sheep and produces the liver fluke. The cercaria leaves the snail and becomes attached to and encysted to grass stalks. These cysts remain dormant until swallowed by the sheep. The number of cercaria descended from a single fluke egg is from 200 to 1,000 or more—thus a single fluke may through the changes described above produce more than 100,000,000 descendants in a single season. About six weeks elapse from the swallowing of the tad-pole before the fluke is matured and begins to produce eggs in the liver of the sheep.

THE SHEEP BOT FLY—OESTRUS OVIS.

Doubtless most of the diseases of the sheep that are least understood, even by scientific students, at the present time, are those due to the presence of internal parasites, of which there are at least over twenty in number, that are well known and described. The majority of these are tape worms or thread worms, one only is a fly. We will close the list with the last, as it is well known to all concerned, and the most common of this class of the enemies of the sheep.

This disagreeable pest is a sort of connecting link between the two classes of parasites, external and internal ones. As a fly, it much resembles a bee, and as it buzzes about the sheep's heads these animals evince great alarm, lowering their noses to the ground and stamping violently with their fore feet. The fly darts to the sheep's head at every opportunity and deposits an egg on the nostril, while still on the wing. It is the work of an instant, and the mischief is done in the twinkling of an eye.

The "egg" thus deposited is a living creature, a minute white grub, scarcely differing from that of the common flesh fly which

we may see deposited in clusters on meat, much to the disgust of the annoyed housewife. The author has spent some hours in watching this habit of the fly, using a hampered sheep as the subject, and has collected several specimens of the maggot. The maggot very soon begins to move in a wriggling manner, drawing



FIG. 18 (a).



FIG. 19 (b).

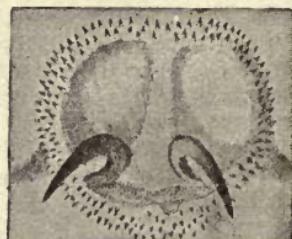


FIG. 20 (c).

Fig. 18.—Adult Female Gad-Fly—slightly enlarged.

Fig. 19.—Full-grown Grub—natural size.

Fig. 20.—Head of full-grown Grub—highly magnified—showing hooks by which the Grub attaches itself to the mucous membrane.

itself into the nostril and disappearing in the nasal passage. In one day—nearly all spent in observing this single sheep—eighteen of these larva were deposited on its nostrils, and it appeared that but one fly was engaged in the business that day. The rest of the flock had hidden near a fallen tree in the pasture, thrusting their noses close to the space between the tree and the soil, or were lying in fence corners with their noses under the lowest rail, or huddled together with their noses buried in each other's fleeces. This is the method by which the fly deposits its living eggs, or newly born living young, upon its host, the unhappy sheep. The fly is shown at fig. 18 (a); its larva fully grown at (b), the hooks by which the grub draws itself up the nostril and attaches itself to the membrane lining the cavity of the skull are shown at (c), and at fig. 21 is shown the part of the skull in which the grub passes fully three-fourths of the year, emerging when fully grown and falling to the ground into which it burrows a little space, and remains until the warm weather, when it begins active business in reproducing its race. Doubtless the greater number of these grubs perish in the interval between emerging from the sheep and completing the final transformation into the fly, falling a prey to moles, birds, and carnivorous beetles; but sufficient number escape to continue the race and make the sheep's summer life, otherwise happy, a miserable one.

The parasite seems to do little real harm to the sheep except to torment it, unless they are quite numerous, when the irritation seems to cause so much restlessness that the sheep do not thrive, but remain poor. The effect of numbers of the grubs is to inflame the membrane, to cause much irritation, and at times to cause

bleeding, the blood trickling down the nasal passages and streaking the copious mucus which is snorted out by the sheep with violent efforts. Sometimes the grubs are thus ejected by the violence of these efforts.

There seems to be no practicable remedy even by prevention, better than in common use, which is to apply a soft, sticky, offensive substance to the sheep's nose by which the eggs are destroyed, or the flies driven away. A mixture of common tar softened somewhat by some offensive oil, is frequently used with good effects. This tar is a wholesome thing for the sheep as an excellent tonic and antiseptic, so that two good uses are made of this application.

When the danger has been greater on account of the larger number of the flies attacking the flock, the sheep's noses need to

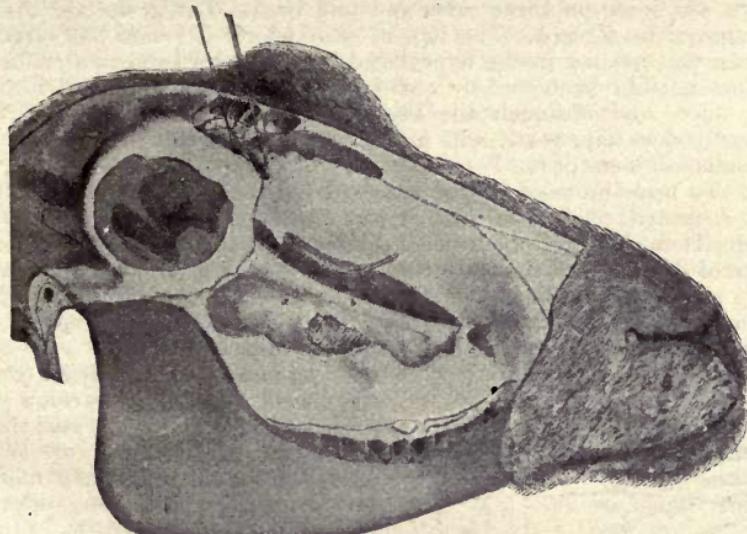


FIG 21.—Sheep's head; sinuses invaded by Grub.

be continually protected by this device, and a mixture of the tar with the strongest smelling fish oil may be used, by smearing the sheep's noses with it daily, or every second or third day.

In cases where the sheep have been seriously attacked by the fly, and numerous grubs have lodged in the nasal sinuses on each side of the head and just above the eyes as shown at fig. 21, an effective remedy is to inject a mixture of linseed oil and turpentine, in equal parts, by means of a suitable syringe made for this purpose. This instrument has a long, slender nozzle, by which the sinus may be reached, and it should be made with three or four openings at the end so that the liquid may be discharged in a sort of spray, or diffused stream, and so reach the grubs. Another plan borrowed from the Scotch shepherds, who have the advantage of inheriting a large amount of old fashioned lore from

their fathers and grandfathers, through numerous generations, is to first apply tobacco smoke in the way mentioned, and the relaxing effect of this causes the grubs to loosen their hold on the membrane, when an immediate dose of fine Scotch snuff, blown into the sinus through the nozzle of the syringe, or any suitable tube, starts so violent a fit of sneezing that the grubs are ejected with considerable force.

When a valuable animal is thus distressed, and it is desired to relieve it when serious danger threatens, it is no difficult matter to remove the grubs by the operation known as trepanning. This is to open the skull by removing a portion of the bone by an instrument specially prepared for the purpose, and—which operating in a circular way in the manner of a carpenter's bit—cuts a round piece of bone from the skull, the flap of skin having been first cut loose on three sides and laid back. The grubs are then removed by forceps. The flap of skin which is somewhat larger than the opening made, is replaced and held by surgeon's rubber plaster, to be protected by a suitable bandage. The wound heals at once, and although the sheep will have a soft spot in its head, as we say, yet it will not at all interfere with its ordinary conduct or health.

To find the precise spot required for the operation this plan is suggested. Shave the wool or hair from the part to be operated on. Then draw a line across the head from the point of the middle of each eyebrow, divide this line by another passing from the tip of the nose in the exact middle to the middle of the forehead. The diagram here given will help to choose the precise spot for the operation, which is in each angle between the lines.

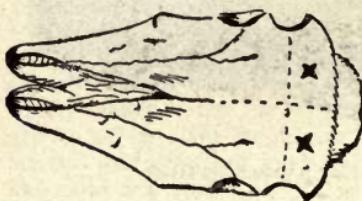


FIG. 22.—Diagram for Trepanning.

of the fly, or of the worm, may be given a very effective means of surviving, for the future annoyance and loss of the shepherd.

ALBUMINARIA.

This disease consists of inflammation of the kidneys. It is accompanied by conspicuous symptoms as a straddling, awkward gait, and tenderness of the loins which give way when pressed. The urine is thick and ropy, and in rams there is a collection of matter at the orifice of the sheath. The disease soon develops into dropsy, when the belly becomes filled with yellow serum and is conspicuously enlarged. The treatment of this disease is

The means of prevention consist in the immediate burning of all heads of dead sheep, and this not only on account of this pest but for the infinitely more serious object of doing away with the larvae of the tape worms which harbor in the brain, and do great damage to the flocks, as previously commented on in this chapter. If the heads of sheep are thrown out, the larvae

more in variation of food than in medicine. The bowels should be kept free by warm bran mashes, and if necessary by the use of saline laxatives as Epsom salts in two ounce doses, given daily. If the kidneys fail to act do not give diuretics, but foment the loins with hot water and mustard. If this is not effective apply fomentations of a strong decoction of digitalis to the loins. The tonic mixture will be of great value in restoring the action of the stomach and bowels.

ANTHRAX—BLACK QUARTER—BLACK LEG—BRAXY.

This disease, called braxy by the English and Scotch sheep-herds, is rapidly fatal, and the first information of its appearance in a flock is usually the dead sheep lying in the pasture in the early morning. It is a special form of the disease of cattle commonly known as splenic fever, or Texan fever; but differs from the common disease in several ways. It is not believed to be contagious to other animals, hence it is due, when prevalent, to some unwholesome condition of the feed or water, or continued indigestion by which the blood becomes loaded with impure matter.

The symptoms are red blood-shot eyes, an excited and alarmed expression of the sick animals, a full, rapid pulse, quick breathing, hot, dry mouth, the limbs and body—especially the belly—are hot and the skin is red, the urine is dark colored and scanty, the bowels are costive, the dung is slimy, and the animal staggers about as if to fall. It generally stands near a fence or a building, with the head down and unable to notice anything.

The later symptoms are harshness of the wool, which, if pulled, comes off in handfuls; the animal becomes insensible, falls, struggles a little and dies; all this occurring in a few hours.

Treatment is of no use. The only thing to be done is to understand the causes of the disease, and prevent or avoid them. After death the body is found already far advanced in putridity. The flesh under the skin, where handling causes a sort of crackling sound, especially on the shoulder and the loins, is found to be filled with gas and much swollen, the blood is thick and black, whence the name of the disease—anthrax, which means black. The belly is filled with a red liquid, the omasum—the third stomach or maniplies—is impacted and filled between the leaves with hard, dry, undigested food; the heart is filled with black blood, and the lungs very red.

Escape from this disease is a matter only of prevention. There is no time for this to be treated in any way. The causes are to be avoided. As it is not contagious in this form, except through poisoning by the dead carcass, it is easily managed after the first appearance of it in a flock.

Exposure to sudden changes of the weather is to be avoided. Excessive warmth, suddenly changing to cold rain and winds, by chilling the body, is one of the most frequent causes. Over-feeding on rich young grass or luxuriant green crops, too suddenly begun; the use of those foods, as the oil-cakes which are rich in protein, and thus unusually stimulating; and equally the

feeding late in the year or early Spring on dead innutritious herbage, are all to be avoided; and it will be very useful at those times of the year when the food is either too innutritious, or too rich and stimulating, to give Epsom salts in two ounce doses, alternately with chlorate of potash in thirty grain doses, daily for three days. The chlorate may be continued after this by itself every second day for a week with advantage.

ANASARCA—NAVEL DISEASE OF LAMBS.

This disease is a form of dropsy, and due to poisoning of the blood by any sudden check to the secretions of the skin by which injurious matter is thrown back into the circulation. In its manifestations, it somewhat resembles the disease described under the head of Anthrax, or Braxy, but differs in the absence of any inflammatory condition of the animal. It appears in the form of swellings on various parts of the body, but mostly on the belly and about the navel, whence its common name among English shepherds, "navel ill." It is accompanied by great prostration, dull and blood-shot eyes and a red and congested mouth. The animal lies and pants, and has no inclination to move. Generally the head is thrown back on the shoulder. The characteristic symptom, however, is the dropsical condition on the belly, under the throat and jaws, where the swollen parts contain a yellow fluid. Finally the limbs swell, the nostrils are swollen until closed and breathing is difficult. The scanty urine is thick and brick-red in color and has a strong odor.

The causes are sudden changes of the weather; exposure to chilling rains; close confinement in ill-ventilated pens; and the prevalence of these conditions in our northern climate tends to aggravate the tendency to this disease among the lambs.

The treatment is to give a gentle laxative, as two ounces of raw linseed oil, after which one teaspoonful of turpentine may be given in sweet milk. Ten grain doses twice daily of chlorate of potash are useful. The swellings should be bathed with slightly warm solution of one dram of carbolic acid in a quart of water. The food should be warm oatmeal gruel sweetened with sugar. Small doses of turpentine are given to stimulate the kidneys, at intervals of three hours. This increased action of the kidneys tends to reduce the dropsical tendency of the disease.

BRONCHITIS—INFLAMMATION OF THE LARGE AIR TUBES IN THE LUNGS.

This disease is an extension downwards of a common sore throat, or nasal catarrh. It is a frequent result of exposure to cold rains after warm weather. It is also caused by the irritation of parasitic worms in these air tubes, when it is called verminous, or wormy, bronchitis. It has two forms, one is mild and soon passes off under naturally improved conditions in a few days. In this form the sheep is dull and stands about without eating, coughing with a hard sound, but soon becoming soft and rattling as the discharge from the nose becomes copious. In such

cases the sheep recover without any special treatment beyond a warm linseed mash given a few times. In severe cases the sheep loses appetite, the mouth is hot and dry, the head is hot, and the muzzle is dry and turned up at the corners, as is seen especially in sheep when seriously diseased and suffering. The cough soon becomes hard, dry, and like barking of a dog. The sick animal hangs its head and seems to be drowsy, or lies with the head on its flank, as if asleep.

The treatment should be to give five drops of tincture of aconite for a full grown sheep, half as much to a yearling, three times in a day. The sheep should be kept in a shaded, clean, airy building, and given warm linseed gruel, or sloppy bran mashes. Four drams of sweet spirits of niter have been found useful, given every three or four hours. When a white discharge from the nose occurs, and the heat of the body subsides, the tonic mixture should be given twice daily, until the appetite returns; when soft mashes and the best clover hay with a few sliced roots will be advisable for the food. Overfeeding is to be avoided, and moderate quantities only of the best kinds are to be fed. The drink may be thin gruel with a little salt added.

CARBUNCULAR ERYSIPelas.

This disease much resembles anthrax, and frequently goes by one of its common names as black leg, or black quarter. It differs, however, in some important points, especially in its contagious character and its communicability to mankind. It, as also does that form of anthrax already described, attacks the finest lambs in the flock, and these die suddenly without notice of the shepherd. A few hours is the common time in which death happens, but some patients linger for two days. The first symptom is lameness in one leg, fore or hind. If the animal is examined the limb on this quarter will be found swollen, and red, and inflamed. On pressure of the flesh the crackling sound of the gas escaping from the already putrid flesh, and gathered in the tissues, is heard. Indeed the same appearances seen in anthrax are conspicuous in this disease, the only difference being in the deadly contagiousness of this disease, which is often communicated to those persons who may handle the carcass of a dead sheep, or the wool stripped from the body of one. This is the deadly disease known as the wool-sorters' disease, which infects those persons who handle the wool stripped from infected carcasses.

The first symptom noticed is the shivering of the sick sheep. The blood in this form is charged with uncountable numbers of deadly germs, to which the malignantly contagious nature of the disease is due, and is in much the same condition as in anthrax; thick, tarry, and black. Blackened tumors appear on the bare parts of the body and the belly is distended with diffused serum, which surrounds the intestines, and in places escapes through the skin as a yellow liquid. Breathing is heavy and labored, and a fetid discharge escapes from the nose.

Treatment is unavailing. The sick animals will be worthless

if they should recover, which sometimes happens, if the poison escapes outwardly by effusion; but it leaves them disabled, and weak and useless to the shepherd.

As the disease is contagious it is best to kill and bury the sick animal immediately, out of reach of dogs, which may spread the poison by dying by its effects, and leaving their dead bodies on the range or pasture. Then preventive measures should be undertaken. Rich, wet pastures should be drained; overflowed lands should be avoided; pure water only used for the flock; and the rank young pastures of the Spring should be used for an hour or two only in the day until the excessive succulence of it disappears. In the same way coarse, innutritious herbage in the Fall should be avoided, as also pasturing on swampy lands, at that time of the year.

DIARRHEA—WHITE SCOUR OF LAMBS.

This disease is rather an indication of a malady than a disease itself. It is the manifestation of a condition of the digestive organs by which the food is not digested, and is discharged in an offensive condition, which is the result of the irritation it exerts on the bowels. It is also one of the symptoms of disorder of the liver. But it exists mostly as the effect of the food on the system. Inferior and indigestible food, as well as those kinds that are too rich in one special element—unbalanced it is termed—and which are thrown off in this abnormal manner, are the most frequent causes.

It happens also as a result of parasites in the intestines, including the liver in this category. Also as a result of the over rich and indigestible character of the milk of a highly fed ewe. Indeed in the ewes any injurious element of the food or diseased product of the system is carried off by the milk, and thus this scour of lambs is really an indication of something wrong with the ewe. It is also a symptom of several special diseases. Thus, its treatment depends on a full acquaintance with the special circumstances of each case. The symptoms are too well known to need repetition. The worst cases are those in lambs through whom the ewe's milk passes almost unchanged, for this implies starvation, and an early death, unless the disease is checked immediately.

In this case the ewe is to be treated, for it is the milk of the ewes which irritates the bowels of the lambs. It is not desirable to give astringent medicines, as the saying is, to dry up the invalid. This makes matters worse, often. A soft, emollient, soothing laxative given to the lamb, to act on the inflamed intestines, and an altreative given to the ewe will be the most effective treatment. Astringents are to be avoided. Mild healing laxatives and tonics are indicated, such as the following:

Epsom salts	2 ounces.
Carbonate of soda	3 drams.
Ground ginger	2 drams.
Warm thin gruel	½ a pint.

It may be well to add two teaspoonfuls of whisky to this medicine, given twice in twenty-four hours. For the lamb one-ha'f of this is sufficient.

A cordial mixture as the following is excellent for a ewe, if none of those ready prepared are on hand:

Tincture of rhubarb	1 ounce.
Tincture of cardomoms	1 ounce.
Carbonate of soda	1 dram.
Hot water or gruel.....	2 ounces.

Add one teaspoonful of glycerine.

CATARRH—SIMPLE AND MALIGNANT.

No other animal is so subject to inflammation of the nasal membranes and those of the throat and bronchial tubes, as the sheep. The discharge from the nose prevails in every flock more or less, and while it is a symptom of several diseases, yet it is a special disorder of the mucous membranes, which at times is serious, as leading to more troublesome disorders.

Simple catarrh appears as a more or less copious discharge from the nostrils, which are inflamed, either as a result of a cold due to exposure to rains or chilling winds, or from any inflammatory state of the system. It is often a prelude to inflammation of the lungs or influenza, and unless treated without delay it is apt to lead to these more troublesome disorders. It is therefore wise to take immediate measures to put a stop to it while it is easy to do so.

The symptoms are sneezing, redness of the eyes, and weeping; at first the nose is dry and rather hot, but soon a thin, watery fluid escapes, which gradually becomes thick and adherent, forming scales on the edges of the nasal passages. This later discharge is yellowish white and has a purulent appearance.

The treatment is as follows: In ordinary and mild cases shelter in a dry, clean, airy shed with a few meals of warm bran and linseed mash, for a few days, together with the application of this powder blown into the nostrils several times a day will usually afford complete relief: Take equal parts of finely powdered sub-nitrate of bismuth, and gum Arabic, and mix them. As much of this powder as will lie on a dime is blown into the nostrils twice a day through a quill. Also give the tonic mixture in the mash mentioned.

If neglected this disorder may be apt to result in the epizootic form, which is much more serious. This disease consists of a purulent inflammation of the lining membrane of the nasal passages, and throat, sometimes passing into the stomach and bowels, ending in inflammation of these organs. If the cause of this disease is known, it is under only the most certain circumstances, for it is apt to occur in the best regulated flocks under certain conditions of the weather. It is certain that its extensive appearance is due to some prevailing general sudden change from warm to cold, or the reverse; to chilling winds, and in flocks that are unsheltered, or confined in ill-ventilated barns; whether the

ventilation be in excess or insufficient the result may be the same. Mr. Randall, in his time, alleged—doubtless then very truly—that this disorder was more fatal to the flocks than all other maladies combined. But we have improved since that day in our general better care of the sheep; and we cannot now say that this disease ever destroys forty or fifty per cent of the flocks, as in Mr. Randall's time, forty years ago.

The symptoms are, first, a thin, watery, acrid discharge from the nostrils. This alone is sufficient to account for the following inflammatory developments; for this discharge soon causes severe soreness of the skin, leading to the following inflammation which supervenes. With this discharge there is weeping of the eyes, and redness and evident soreness. The animal droops and is disinclined to move, but stands listlessly about, neither eating nor drinking. There is no cough, but evident increasing weakness, while the discharge, at first thin, becomes thick and glutinous, and at times is tinged with blood. These symptoms increase in severity until the sheep becomes greatly prostrated and emaciated. The eyes then are partly closed and the lids adhere in consequence of the glutinous discharge. The breathing is labored and difficult. Sheep in good condition are not disturbed as to the action of the bowels, but those that are poor suffer greatly from dysentery. The dung is mixed with blood and is voided with much pain. In ten days the sufferer dies. After death the lining membranes of the nose and nasal cavities of the head are found to be highly inflamed and often ulcerated.

Treatment is always unsatisfactory. Either the patient dies, or slowly recovers, greatly depressed; and next to worthless for the future. The most satisfactory treatment consists of giving concentrated food of the most nourishing and easily digestible kinds; such as gruels, mashes, and thin mucilaginous drinks, with the tonic mixture added in the proportions given. No bleeding, or weakening purgatives, are to be used. Dry and warm, but unchanging temperature is indispensable. To maintain the strength of the patient in this way is the only hopeful treatment.

Mr. Randall advises the following medicine which he found entirely satisfactory when taken in the early stage of the disease:

Corrosive sublimate	8 grains.
Rhubarb.....	1 ounce.
Ground ginger and gentian each.....	2 ounces.

Simmer the three last in one quart of water, for fifteen minutes; strain and add the first. Give two tablespoonfuls twice a day. The experience of the author has been that the most careful nursing to sustain the strength is the most effective, with the use of the tonic mixture.

COLIC OR BELLY ACHE.

This disease is due to the fermentation of food in the stomach. It exists in the first stomach, the rumen. It is akin to the well known bloating of cattle. It is due to the over eating of suc-

ulent green fodder, especially when it is wet or covered with frost. Musty dry food is another frequent cause of it. Sometimes it occurs through a constitutional or accidental difficulty of digestion.

The symptoms are a swelling of the belly on the left side, occurring soon after eating. The breathing is oppressed by reason of the pressure of the distended stomach on the lungs. The bowels are inactive and the eyes have a wild expression, due to the severe pain, and the sheep moans at every movement.

The only effective treatment is to relieve the pressure on the stomach by puncturing the wall of it with the trochar, thus letting the accumulated gas escape. If it is possible for the animal to swallow, a dose of one-half ounce of carbonate of ammonia will afford relief in cases when the trochar is not at hand. But it is quite safe to puncture the stomach on the left side at a point at the center of a triangle of equal sides about four inches each way from the hip bone, in a line below the kidneys, and to a point below it where the sides of the triangle will meet. A small pen knife will be a safe instrument to use. A quill tied around with a cord at one end, to prevent it from slipping in the wound, is inserted to keep the wound open while the gas is escaping.

Relief is often found in the use of the following medicine given by the mouth:

Ground mustard..... $\frac{1}{2}$ teaspoonful.
Whisky 1 ounce.

Mix and give in a small quantity of warm water. Repeat when needed.

FOOT ROT.

This disease of the sheep's foot is mostly prevalent on wet, marshy lands, by which the horn of the foot is softened and the skin between the toes is chafed and worn, until the lamina of the foot—which connect the horn to the fleshy interior and the vascular sensitive tissue, through which the veins and arteries run—become inflamed, and exude purulent matter. These lamina being inoculated with fungoid germs existing in the infected soil, are decomposed by the action of these germs, and the interior of the foot rots away; after which the horn separates and decays. The decaying horn produces a peculiar fetid odor by which this disease may be recognized at some distance from where a diseased flock is pasturing.

The sheep's foot is provided with a self-lubricating apparatus placed in the cleft of the hoof, known as the interungulate gland; and a canal which leads from it to the outer surface between the toes. This gland secrets a lubricating fluid which softens the skin, and prevents chafing. It is readily perceived how the stoppage of this canal should induce chafing by the grinding action of the wet mud, or sand and gravel, on this soft skin between the toes. And equally how soon the inner parts of the foot may become raw and inflamed, and offer the most favorable oppor-

tunity for infection by the special germ existing in the decaying soil. This is the history of this disease which is exceedingly troublesome once it makes a start on a pasture and in a flock.

Prevention is obvious. Drain wet pastures. Avoid feeding sheep on wet, muddy lands. And carefully inspect the feet, at short intervals, paring the under curved walls which turn under



FIG. 23.—Early Stage of Foot-Rot.



FIG. 24.—Advanced Foot-Rot.

the sole, and gather the offending matter. When the disease occurs, carefully dress the sores with any prepared hoof ointment, after washing them in a solution of one pound of sulphate of copper in 5 gallons of water, and in the same proportion as one ounce to 1½ quarts of water. An excellent ointment for the feet so diseased is made in this way: Melt four parts of Burgundy pitch, add one part of vaseline, one part of turpentine, and one part of acetate of copper finely powdered, and stir until cool. Apply this to the pores. Keep the sheep on clean pasture until recovery.

It will be obvious that this treatment is wholly inadmissible in large flocks. Some more convenient method is used in these cases. A suitable arrangement is made by which the flock may be passed through the curative antiseptic preparation placed in a trough of suitable size, in much the same manner in which sheep are dipped as a preventive and cure for the seab, as will be described hereafter under the appropriate heading. The trough should have sufficient length to thoroughly introduce the disinfecting liquid, which is two inches deep in the trough. The flock is first driven up or down a stream of clear water, or the feet are prepared by paring off the diseased horn so that the disinfecting fluid may penetrate to every part of the feet. This operation is most conveniently performed at the shearing time, and is then in-

dispensable for safety if the least evidence of the disease is noticed in the flock. And as each sheep is shorn it is immediately passed through the disinfecting liquid in the manner mentioned. Indeed this is the time when the sheep should be dipped for the scab disease, and all three operations are thus easily and cheaply performed by any suitable arrangement by which the flocks may be passed through each in succession.

As this disease is extremely virulent, a close watch should be kept for its appearance, and any sheep going on its knees should be immediately caught and operated on. Prevention, as in the equally serious disorder of the scab, is imperative, as the cheapest and only practicable means of avoiding enormous trouble in a large flock of sheep. It is also a wise precaution to closely examine the feet of any purchased sheep, especially those which have been transported on the railroads, in the common sheep cars, before they are turned out into a flock. There is no more dangerous possibility of infection than this, and as to be safe is better than to be sorry, the importance of this precaution cannot be overestimated.

There are several kinds of preparations in use for this purpose, but the sulphate of copper solution is generally esteemed to be the most effective. This may be prepared as follows: Five pounds of the sulphate of copper are dissolved in five gallons of water, six pounds of fresh lime are slaked in four gallons of water, the two liquids are strained into a cask and diluted to twenty gallons. This is not so caustic as the sulphate alone, but is equally effective.

IMPACTION OF THE STOMACH.

Sheep are not so subject to this disease as cattle are, but at times they will overgorge themselves, as on fresh clover, covered with early frost, and by the chilling of the stomach digestion is prevented and fermentation occurs. This causes a large quantity of carbonic acid gas to form in the stomach and the pressure of it, closing the openings of the stomach at both its extremities, great suffering ensues. This occurrence obviously interferes with the giving of any relief by medicine, and the only recourse is to an operation by which the stomach is pierced and the collected gas is let out. The right spot for this opening is at the center of a triangle the base of which is about four inches long in a sheep, and runs along the body sufficiently low to avoid the kidneys, and the other two sides meet at a point directly below the middle of the base. The puncture is made by means of a sharp-pointed instrument called a trochar, fitting in a tube called a canula. The part of the body indicated is pierced with this instrument, which is then drawn out leaving the canula or tube in the opening. The gas thus escapes, and the needed medicine is poured into the stomach (the rumen) through the tube, which is furnished with a cup-like top for this purpose. This medicine consists of one dram of aromatic spirits of ammonia, followed in one hour by two ounces of raw linseed oil.

After recovery, careful feeding is necessary, the tonic mixture previously mentioned at the outset of this chapter being given. The wound made heals quickly, but it is well to shave off the hair and apply a tar plaster over it and keep it on for a few days.

INFLAMMATION OF THE BRAIN.

Of this serious disease there are two forms. One is inflammation of the covering membrane of the brain—the meninges—(whence the common name of this disease meningitis), and the other is inflammation of the substance of the brain itself. There is a special difference between these two forms of the disease. The former is characterized by more violent symptoms as delirium, violent movements, pawing, champing of the mouth, and general convulsions. In the latter the animal is dull and stupid, and unable to move the limbs. In both cases there is trembling of the body, high temperature, increased and hard pulse, quick breathing, red eyes, glaring as by nervous excitement. The sick animal bores its head against some obstacle, or lies on the haunches, or rests against any support that may be convenient. The sheep bleats during the period of excitement, at other times resting in a condition of stupor. The causes are mostly sudden and serious changes of temperature; exposure to severe weather, heat or cold equally; over exertion; indigestion of some standing, or sudden over-loading of the stomach with rich food. Feeding on smutty or ergotted grain or fodder produces this disease by the effect of the special poisonous principle known as ergotine, which has an injurious effect on the nervous system in this way.

The treatment consists of the application of ice-cold water to the head and neck; injections of turpentine, two drams of it mixed with sweet oil, also a strong purgative, as four ounces of Epsom salts, with six drops of croton oil added to the solution, and shaken up with it. This is followed in a few hours by half dram doses of bromide of potassium given every three hours. The patient is kept in an airy stable free from all disturbance, as this leads to renewed excitement. This treatment applies to both forms of the disease. After recovery the patient is to be well fed, but with only the most easily digestible food, given in small quantities, at short intervals until full recovery.

INFLAMMATION OF THE SPINAL CORD—MYELITIS.

This disease also has two forms, the ordinary sporadic kind, which is due to distinct and special local causes; and the enzootic form, which at times prevails extensively over a large territory, being due to causes which are generally prevalent. It is known as myelitis, and consists of inflammation of the covering of the great nerve known as the spinal cord, this outer covering being known as is that of the brain, as meninges; whence is derived the full name of the disease—spinal meningitis.

It also goes by the name of myelitis, and is extremely frequent in certain localities in which some special conditions exist

that are not well understood, but are believed to consist of some unfavorable qualities of the water and the herbage. It is known by English and Scotch shepherds as the louping ill, or hydro-rachitis; from which is derived the common term rickets; applied to young animals affected by weakness of the hind limbs. See fig. 25.

The common form is similar to inflammation of the brain in its effects on the animal, and similar symptoms are perceived. These are paroxysms of convulsed movements; a high temperature; a rapid pulse and breathing. These finally end in paralysis

of the hind parts, so that the young animals, which are mostly subject to this disorder, drag their hind limbs along without ability to move them. There is a great tenderness along the spine, and the animal shrinks when the spine is pressed. If the patient is able to stand is is only in a staggering way, and it rests its head against any support within reach.

These symptoms are greatly increased in the enzootic form. Lambs are frequently born diseased, and are paralyzed from their birth. Others are attacked later, and after a time up to a year and a half old. The old sheep are rarely subject to the disease. The lamb in some instances has the head and neck drawn to one side, others exhibit spasmotic movements by which they seem to be endeavoring to leap, using, however, only their forelegs. From this symptom the local name of louping or leaping ill or disease is given. But mostly the lamb lies half reclining on the ground and drags its hind parts along as shown in the illustration, fig. 25.

The causes seem to include among others generally applicable to this class of diseases, a certain distinct unwholesome quality in the herbage, thought to be due to the geological character of the soil, by which excessive succulence is given to it, leading to chronic indigestion and mal-nutrition. This is believed to be the case, for the reason that the disease may prevail extensively and severely in some locality which may be distinctly separated from adjoining lands of a different geological origin. It is well known that a limestone soil is productive of increased fertility and luxuriance of the pastures, or of grown feeding crops, and we know that any seriously unbalanced character of the food does affect the nervous system more or less disastrously.

This is all the more to be considered as being well founded, although we have no satisfactory certainty of it, by the special accompanying symptoms which are noticed at the outset of the disease. As for instance, there is a depraved appetite, and a voracious desire for coarse innutritious food; and stones, sand, decomposed matters, rotten wood, and such like substances are greedily devoured and swallowed. The grass is not bitten,



FIG. 25.—Myelitis.

but torn eagerly from the ground, and the roots with adhering soil is swallowed with avidity. But when the disease is advanced, appetite fails; the eyes stare wildly; the temperature is lower than that of a healthy animal, pointing to want of support to the vital functions; and this reacting on the brain and the principal nerve proceeding from it, produces all the symptoms which mark this disease.

This being the case, the treatment calls for prevention rather than curative measures. The causes mentioned are to be avoided, and the ewes must be duly nourished with the best and most digestible food before the lambs are about to be dropped; indeed from the period of conception. This is to be thought of in all these localities where the disease has prevailed previously; and with the drainage of wet pastures, and the dressing of the lands under feeding crops with rich stimulating manures, changed for the use of such special fertilizers as will tend to the growth of wholesome feed. Superphosphate of lime is especially useful in this respect, and a dressing of the feeding crops or pastures with salt has been found useful in clearing the land of this tendency to this disease.

Treatment in all cases calls for the use of nerve sedatives as well as cooling laxatives. Epsom salts are to be given in full doses, one to two ounces for a lamb, and twice as much for a ewe. Turpentine in two dram doses acts favorably on the kidneys, and as an anti-spasmodic. After these have been given, bromide of potassium is to be given in one dram doses for a yearling, and less in proportion for a lamb as its age may call for. Good nursing is efficacious in support of the weakened system, and after recovery the tonic mixture will be useful in aiding digestion, and the due assimilation of the food.

PLEURISY—INFLAMMATION OF THE LINING MEMBRANE OF THE CHEST.

This disease is most common in cold, windy, exposed localities, and chiefly among flocks on the range and without shelter. It frequently accompanies an attack of rheumatism in which the joints are involved, and severe lameness is the prevailing symptom.

The symptoms are shivering, uneasy movements, pawing the ground, turning the head to the flank, general uneasiness—the sheep lying down and rising alternately with frequent intermission. The pulse is rapid and the breathing hurried, with short inspirations suddenly checked, while the inspiration is slow and prolonged. At every breath the abdomen moves and the head is held down, the eyes are half closed, and a hacking cough occurs. Appetite and rumination are both suspended and the nose is dry. Lameness and stiffness of the joints due to the accompanying rheumatism are prominent. This disease terminates in hydrothorax, or the effusion of serum in the chest. These symptoms continue for about four or five days, when they gradually change to those resulting from the accumulated serum in the chest.

Then the belly becomes swollen, and a peculiar drawing in of the nostrils occurs. In this condition of the disease the manner of breathing is reversed; the inspirations being long and irregular, while the expiration is checked and occurs with difficulty. The animal now stands with legs wide apart, the head is extended, and the neck is held low; the eyes are staring; the pulse is imperceptible; the limbs, nose and ears are cold; a rattling sound accompanies the breathing; the animal totters and falls backwards, if the head is raised, but headlong otherwise, and dies struggling.

On opening the body the chest is found filled with serum, the substance of the lungs is hard and red, and the tissue is dull in color and sinks in water.

The treatment to be taken as soon as the rattling sound is heard in the breathing, is to give the following:

Saltpetre	1 dram.
Camphor	$\frac{1}{2}$ dram.
Nitric ether	$\frac{1}{2}$ ounce.

Dissolve the camphor in the ether, and add half a pint of oatmeal gruel strained. Then powder the saltpetre, and add it to the gruel. The chest should be well rubbed with mustard made into a thin paste with hot water, and a skin saturated with hot water should be tied around the body immediately back of the fore legs. When the presence of the serum in the cavity of the chest is certainly known by the occurrence of the symptoms mentioned, give the following in a drench of warm gruel:

Powdered digitalis.....	10 grains.
Saltpetre	1 dram.
Nitric ether.....	2 drams.

Mix; add to the gruel; and give it three times a day.

Two drams of turpentine are given alternately with the above, all of which should be continued for two days. As soon as the kidneys respond to this treatment, give the following:

Sulphate of iron	$\frac{1}{2}$ dram.
Alum	$\frac{1}{2}$ dram.
Infusion of quassia.....	1 ounce.

To tap the chest with the trochar previously described and drawing off the liquid through the canula, will be of great service. As soon as recovery has begun give the tonic mixture.

INFLAMMATION OF THE UDDER—MAMMITIS—GARGET.

This disease is frequent in well fed flocks, and among ewes in high condition. It also at times occurs by reason of the excitement of the circulation incident to the birth of the lamb, leading to inflammation of the weakened glands. It is frequently the case that the first milk by reason of its glutinous character may close the duct of the teats, thus producing a congested condition by which inflammation is caused. Of course this trouble means the death of the newly born lamb for want of its due nourishment.

It is a disease to be prevented by timely attention, for an

attack of inflammation necessarily means stoppage of the milk, and if for only a short time the lamb is starved, or much labor is thrown on the shepherd. And this occurring at the busiest time of the year is a serious disturbance of the ordinary routine in a flock at the lambing season.

The ewes should be examined as soon as the lamb is dropped, and the condition of the udder and the teats known. It is a small matter as compared with the result, which is not only the saving of a lamb but the welfare or future value of the ewe. For once the udder is in this condition of inflammation, it is an even chance if the ewe can be restored to usefulness for the future. There is no danger if the milk will appear on pressure of the teats. If not, the opening of each teat is to be carefully cleaned from accumulated gluey matter by washing with warm water, and the insertion of the point of a small syringe by which a few drops of warm solution of saleratus or carbonate of soda may be injected. This dissolves any hardened milk, and leaves a free course for the milk for the lamb at its first effort to suck. If this is not sufficient, and the teat appears to need it, a smooth whalebone probe, well oiled, should be inserted with care and gentleness to open the milk duct. If the udder appears to be at all inflamed, it will be advisable to inject a little more of the soda solution, adding a little glycerine. The udder should be rubbed gently with vaseline to which is added one fourth part of camphorated spirit, and the same of ammonia, at least twice a day.

PNEUMONIA—INFLAMMATION OF THE LUNGS.

This disease differs from pleurisy in being seated in the substance of the lungs. The difference may be more fully explained in this way. The cavity of the body within the short ribs, is commonly called the chest. It contains the lungs and the heart, and is separated from the abdomen by a tough strong fibrous membrane known as the diaphragm. This is elastic, and as the lungs are inflated by the inspiration of the breath it gives way, returning to its original position on the expiration of the breath. The whole interior of this cavity is lined with a serous membrane, covering the walls of it up to the entrance into it of the wind pipe and the esophagus, closing these in into the space of the chest, and covering them as well, and also the lungs. This membrane is called the pleura, and is the seat of the disease known as pleurisy. This membrane—the pleura—is in fact like a sac doubled into itself and enclosing those vital organs which are seated in the cavity of the chest. Inflammation of this membrane is called pleurisy; that of the lungs itself, its substance in fact, is called pneumonia. This disease has the same common cause as bronchitis and pleurisy; but it is more common than these, and has greater tendency to relapse and terminate fatally by the hardening and solidifying of the tissue, so that expansion necessary to the inflation of the lungs in the air breathed, and the emptying of them of the air expired by contraction, can no

longer go on, and of course the animal dies for want of air and the purifying of the blood by it, as is explained in the chapter devoted to the anatomy of the sheep.

The symptoms of this disease are sufficiently well marked to afford certain indications of its existence and to distinguish it from pleurisy. They are dullness, stiffness, a rough, harsh fleece, and a fit of severe shivering. The skin soon becomes dry, hot and shrunken on the body; the eyes, lips, and inside of the ears are red; the nostrils are drawn in, and there is a short cough, suppressed by effort to avoid the severe pain caused by the action of the lungs thus induced. The mouth is hot and clammy, there is a sticky discharge from the nose, the head is protruded, the breath is short and quick—40 or more per minute—while the effort to breathe is made by the muscles of the abdomen shown by the heaving flanks. The pulse is rapid, reaching 70 or 80 per minute. The bowels are constipated; urine is small and dark in color; the sheep is averse to move and lies still.

On placing the ear to the side of the chest the usual movement of the breathing is absent wherever the tissue is solidified, and so far it is possible to trace the extent of the disease. When these symptoms lessen in degree recovery is in progress, and with good care the imminent relapse may be avoided. But it is only by the best care that this happens, when the disease is checked, and convalescence is complete in about fifteen days. Otherwise death takes place from the fifth to the twelfth day.

Treatment is the same as for bronchitis (to which refer). If the bowels are constipated two ounces of Epsom salts will be useful. It is best given dissolved in warm oatmeal gruel or linseed tea. This disease is not to be confounded with the epizootic and contagious form of pleuro-pneumonia, a disease which occasionally attacks sheep, but only in its sporadic form, which is not contagious, and consists of both pleurisy and pneumonia combined. For this combined disease the treatment is similar to that indicated for simple pneumonia or for pleurisy.

HERPES—INFLAMMATION OF THE SKIN WITH BLISTERS.

This inflammatory condition of the skin is accompanied by small vesicles, or blisters, containing serum. These may burst and thus form extended sores, the exudation from which mats the fleece, and has much the same appearance as the very much more serious disease known as the scab. It is indeed frequently thought to be this disease, and much unnecessary concern may arise in consequence. It is caused by over stimulating food, especially over rich in the protein elements, such as cotton seed meal, or the linseed oil meals. Exposure to continued wet weather after shearing, is productive of this condition of the skin.

The treatment is to give four ounces of Epsom salts, repeated the second day after. If crusts have formed these may be broken and removed by washing with warm water and carbolic soap, but care is to be taken not to injure the tender skin under

these crusts so as to cause bleeding. It is well to soak the scabs with oil before washing; and to repeat the washing until the crusts may be removed without leaving a sore. If the skin itches, so that the sheep bites itself, the inflamed patches may be washed with water slightly acidulated by sulphuric acid; a few drops to a quart of water is sufficient.

DISEASES OF THE PENIS.

The ram is subject to diseases of the penis which may easily destroy its value for service in the flock. These are first:

Inflammation of this organ which may be simple or cancerous. The former is treated by a few doses of four ounces of Epsom salts and injection into the sheath of solution of chlorate of potash. This may be injected by means of a syringe or a glass tube with a rubber cap on the end by compression, of which when the tube is inserted in the solution, the release causes the fluid to be drawn up, and pressure on the cap or bulb, of course ejects the fluid with considerable force. It may be well before applying this solution to wash the passage with warm water with a few drops of carbolic acid in it, or with carbolic soap to dissolve and remove the coating of pus on the diseased parts. If the disease is cancerous the animal should be turned on its back and the organ withdrawn and the diseased spots touched with solution of nitrate of silver. This destroys the fungous growths after which the chlorate of potash solution will complete the cure.

Sometimes the ram by hard service contracts this cancerous form of the disease which he communicates to the ewes and these suffer from a similar inflammation of the vaginal passage. This is to be treated in a similar way but using a slender elastic rod of whale-bone with a soft sponge fastened securely to one end. This is dipped into the solution of chlorate of potash and after washing out the part with warm water and carbolic soap, it is passed into the vaginal passage until the diseased membrane is well washed with the solution.

PARTURITION FEVER IN EWES.

Ewes are sometimes liable to a serious disease of the blood, consequent on the disturbance of the circulation due to the separation of the lamb from the dam. It is to be considered that in its fetal life the lamb is supplied with blood for its life and growth from the dam. After birth this leaves an excess of blood to circulate in the ewe, and if she is in a plethoric condition this increased circulation is a source of danger to her, and may be productive of what is known as parturition fever. This is all the more likely to happen with full fed ewes, especially if they are on a rich young pasture.

The symptoms occur on or about the second or third day after the birth of the lamb. They consist of enlarged flank; a staring wild appearance of the eyes; constipation; and deficient urine, which has a deep color and an unusually strong sharp odor. The ewe pants, strains, and the hind parts appear inflamed, swollen and red, and are hot to the hand.

Afterwards they become deep red, then purple, and finally black in color. As the disease advances, unless improvement occurs, the ewe becomes exhausted and dies in a comatose condition, due to the excessive pressure of blood on the brain.

The womb is found on examination to be inflamed, patchy, and even gangrened, and black and decomposed. The whole system is congested and full of blood, the heart especially so. The womb is highly inflamed and the veins often contain pus instead of blood. As this disease is apt to affect other ewes in the flock, the first one dead should be examined for certainty as to the disorder, so that preventive measures may be taken if required to save others. These are to give a copious laxative (Epsom salts) to the ewe; four ounces will not be too much. Following this, give tincture of aconite in doses of five drops repeated every six hours. Copious bleeding from the vein on the face just below the eye is useful to relieve the congestion. Injections of warm soapy water are desirable to relieve the bowels. After these remedies are used for 24 hours give the tonic mixture in warm gruel three times a day.

POISONING.

A sheep is a foolish animal, and is as apt to eat injurious stuff as to choose good food. And as there are many poisonous plants that sheep come in the way of, and will eat readily, caution is to be observed to destroy them or keep the sheep from them, and it is well to be prepared to take the right means, and have in readiness the right remedies, to prevent losses in this way. The most prevalent and deadly plant of this kind is that member of the heath family known as the narrow leaved kalmia (*Kalmia Angustifolia*) or commonly "sheep's laurel," and "lamb kill." Indeed there are several plants of this heath family that are poisonous. The rhododendron is equally virulent with the laurels, of which the broad-leaved species (*Kalmia latifolia*) is a dangerous as the narrow leaved species. Some of the huckleberry tribe are fatal, as well as several others. Indeed it is quite probable that all this family of plants are alike in this respect. The so-called cow-parsnip and some other plants of the Umbellifera family, to which this wild parsnip belongs, are even more deadly than the heaths. Some plants, really not poisonous, are injurious, if not fatal, in their effects, not on account of any poisonous character, but only because of their indigestibility. Such are the leaves of the mangel or field beet, when grown on rich soil; the common hollyhock, and the common marsh mallow; so with oak leaves and acorns, for these are all without any ill effects excepting when eaten in large quantities; and the symptoms are then all those of acute indigestion. Acorns and other mast are really valuable food, and thousands of sheep fatten on these fruits of forest trees late in the year, and during the early winter months without any ill effects being reserved.

In the far West, and as far as California, the so-called loco-weed (*Astragalus mollismus*) also known as crazyweed and some

other plants are poisonous to sheep, as well as other animals, but not deadly in effect, merely producing narcotic results, and acting on the brain to produce actual temporary insanity.

The worst of all these are the various members of the heath tribe above referred to. These affect the brain in such a way as to cause loss of sight, inability to swallow, and consequent pro-



FIG. 26.—Loco Weed.

fuse salivation. Animals dying after eating largely of these leaves and twigs are found to have the brain extensively congested, the heart is filled with venous blood, and all the symptoms of ordinary apoplexy are seen. The author in an experiment made to test the precise action of the leaves of the narrow laurel, eat a few of them. In a few minutes considerable nausea, giddiness, clouded vision occurred; the eyes being at times unaffected by light, and the limbs were greatly disturbed and stiff in their movements. Strong coffee relieved the nervous disorder in a short time; while a liberal dose of castor oil relieved the stomach and bowels. This treatment has been effective in every case for the sheep when taken in time, and since then there has not been a fatal case of poisoning where this treatment has been adopted.

From the nature of the alkaloid existing in the crazyweed of the Western plains, it is we think beyond question that this same treatment will be useful as an antidote to the effects of this weed.

The leaves of the yew tree are exceedingly deadly in their effects, and while we have none of this kind among our native trees, yet in other countries, where it is cultivated or grown in hedges, or indeed for hedges, sheep should not be permitted to browse on them or eat the clippings of the limbs.

Cases of poisoning sometimes occur by giving too large doses of drugs, the action of which is virulent. Thus the use of salt-peter (nitrate of potash in excess; in truth it is rarely called for) is apt to do serious injury. So aconite, a deadly poison in too large doses, but a useful remedy in many diseases as a sedative and diaphoretic, allaying nervous excitement and inducing perspiration, may be given to excess, carelessly, on account of the very small doses required, for a sheep, no more than 3 to 5 drops. In such cases immediate ridding to the system of the poison, by copious liquid purgatives, is the simplest means of avoiding loss. After recovery the tonic mixture should be used, with soft mashes or gruels of linseed or oatmeal, or both. When any poison is accidentally taken by sheep it will be useful to drench the animal with mucilaginous liquid by which the stomach may be washed out, and immediately after a dose of castor oil or raw linseed oil may be given to empty the stomach and bowels.

PORCUPINE GRASS.

This grass is quite common on the plains and has been found exceedingly injurious to sheep. It is a tall grass with a bunch of sharp pointed, speared awns in the head. These have a very peculiar character. They are twisted when dry like a corkscrew and as they become damp the screw unwinds, becoming more spiral as the weather dries them again. The sharp points penetrate the wool and as this spiral unwinds and winds again these points are literally screwed into the sheep's skin, penetrating into the flesh and even passing into the inside where of course these spears do serious mischief, frequently killing the sheep with all the symptoms of a slow, wasting disease, which is rarely recognized. This of course calls for a corresponding watchfulness on the part of the shepherd to keep the flocks away from those localities where it abounds. When the grass is in flower it is much like an ostrich feather with its soft, silky plumes, under which these awns are to be found.

RED WATER—HAEMATURIA.

This is a disease distinctly of marshes and wood lands, of which the herbage is often acrid and indigestible. There are certain weeds by which this disorder is produced, but in general, either the whole herbage is innutritious or unwholesome, or the poisonous emanations from the sodden soil makes the blood impure at the very source—the lungs—where it should naturally be

purified and vitalized. It also has one of its causes in the too succulent and innutritious crops grown on over-rich damp lands, and turnips especially grown on soils of this character—deep black vegetable soil—are frequently the cause of attacks of this disease of flocks fed on the crops. So the natural growth of wood land tends to encourage this disorder, and hence it is commonly known as the “woods evil.” The disease is especially virulent in the early Spring for the reason that the sheep are hungry for fresh fodder, and eat too heartily of the indigestible or too laxative foods. It seems in its manifestations to be akin to the common anthrax, a disease often due to similar causes. The blood is dark, there are dullness, weakness, trembling, cold skin, dry mouth, loss of appetite, thirst, strong action of the heart; the bowels are costive after a period of looseness, the urine is passed with suffering, and is dark colored. This color is not due to the mixture of blood but to failure of the liver to act. Unless improvement occurs in a few days the animal dies in a condition of delirium and severe prostration.

This is a disease to be prevented by avoiding the cause of it. By keeping the sheep off from the over-grown herbage of unwholesome lands, and refraining from feeding, even hay cut on such land. The drainage of the wet soil will remove this objection to it, and render the crops harmless.

Treatment should consist of the use of active purgatives; any of the oils are preferable in this case to saline medicine. Olive oil is the best and most effective, after this raw linseed oil may be chosen. A quarter of a pint will be a sufficient dose for a full grown sheep. It should be repeated in six hours if it does not operate before that time. Twenty grain doses of chlorate of potash may be given in gruel three times a day. The standard tonic mixture should then be given twice a day. The food should be of the best and most easily digested kinds. Decoctions of linseed or of slippery elm bark; bran mashes, and boiled oats, will be desirable.

REDNESS OF THE EYES—OPHTHALMIA.

This disease should be treated on the first appearance of it or the sight may easily be lost beyond recovery. This indeed is not of much account in a sheep, if it is in good condition, for it will always make mutton unless it is affected by some wasting disease, by which its condition is impaired. But all sheep are not necessarily immediate mutton, and a valuable breeding animal is not to be considered from this point of view. Redness of the eyes is not to be neglected. Treatment should be immediate. The disease is also apt to become epidemic in the flock, for the purulent matter flowing from a diseased eye is very apt to convey the infection to other sheep.

The cause of the disease should be investigated. There may be a chaff or beard or some minute foreign matter causing the trouble. If so it is to be removed; and a small pinch of burned alum blown into the eye through a quill will quickly restore the

eye to comfort and use. If the inflammation has been severe two ounces of Epsom salts should be given in gruel and the animal kept in the dark for a few days. Frequent bathing of the eyes with cold water with a small pinch of sulphate of zinc dissolved in it, will be useful.

SMALL POX OF SHEEP—VARIOLA OVINA.

This deadly disease, so closely akin to the same disease of mankind as to be communicable to those coming in contact with diseased sheep, so far has not been known on this side of the Atlantic Ocean. But in the importation of sheep for breeding from European countries, where it exists to a dangerous extent, it is always liable to be introduced into our flocks. A description of the disease is therefore of interest. It is only known as a virulently contagious disease, having a period of incubation of four or five days in Summer, and ten to fifteen in the Winter.

The symptoms are loss of appetite, dullness, isolation of the sick sheep, and stiffness of the hind part of the body. Trembling follows; the bowels become costive; the eyes are red and weep copiously; a discharge comes from the nose; and the naked parts of the body have red patches. These may appear on the belly or inside the legs. If they become united—confluent—the result will likely be serious. Otherwise the disease passes through the usual stages as in cow-pox; that is the eruption exudes a lymph which in a short time becomes purulent, then dries, and forms crusts which loosen and fall off, at the end of three weeks or a month. In this mild form the loss of life may not be over five to seven per cent, but when the disease takes on its virulent form it destroys at times almost the whole flock. There are other serious results even to the mild form of this disease. Ewes are prone to abort and lose their lambs; the wool drops off; blindness occurs; hoofs rot off; and the sheep which survive are frequently wrecks not worth saving. The treatment is hardly to be recommended. Immediate slaughter and deep burial of the diseased carcasses—in short unlimited stamping out of the pestilence, which being communicable to persons, is and should be the only treatment thought of.

Prevention of it should be the business of the general Government, but as private enterprise should lead to caution in running risks of introducing this disease, all concerned should pass all imported sheep through a sufficient quarantine before mixing them with the flock. Inoculation is not to be thought of as long as the disease is not existing here.

RETENTION OF THE DUNG IN LAMBS.

Sometimes it may happen that by the first glutinous discharge from the bowels of a new born lamb, the anus becomes closed, and the dung is no longer passed, but collects in the lower gut. This becomes distended, and if relief is not afforded the young animals droops and soon dies. The ewes, inclined thereto by natural instinct, will sometimes afford relief by rubbing the

part with the nose and licking it. But in some cases this is not effective, and the shepherd should not fail to inspect the young things for the first few days after birth, and if necessary break this crust and open the passage. A little vaseline or sweet oil applied will prevent a recurrence of this trouble.

INFLAMMATION OF TESTICLE.

This disorder is by no means uncommon. It is most common in the breeding season, when the ram may be overworked, and it is frequently the result of accident.

The symptoms are quite apparent, being a swelling of the glands so that the animal moves with a straddling gait, the testicle, or both of them, is enlarged and tender to the touch, and is frequently drawn up and let down again.

The treatment is to give cooling purgatives, as Epsom salts, in four ounce doses; to foment the scrotum with hot water; then applying extract of belladonna or laudanum. If the disease occurs in the breeding times of course the ram is to be separated from the flock and should not be used again the same season.

CASTRATION OF TESTICLES.

The castration of the young rams intended for wethers, is sometimes apt to lead to serious results and even the loss of the animal operated upon. All risk of this is avoided by performing this necessary operation while the lamb is young, and at about two or four weeks old. At this time the organs are undeveloped, and the operation is a simple one without risk of complications by inflammation of the cord, or difficulty of healing of the wound.

For a lamb of this age, all that is needed is to take the animal under the left arm, holding the scrotum with the left hand, between the fore finger and the thumb, then with a pair of sharp shears cut off the scrotum with its contents. Apply a little finely powdered bluestone (sulphate of copper) or a little fine sugar, and the business is concluded in less time than this line is written.

With older animals more care is to be exercised, as the organ is developed to a far greater extent. With three or four month old lambs intended for wethers the operation is thus performed. An assistant holds the animal firmly in any convenient position, preferably on a bench about three feet high. The assistant holds the hind legs firmly, drawing them forward. The operator then with the left hand gathers the loose skin at the bottom of the scrotum by the fingers and with a round-edged, bladed castrating knife, cuts off the whole bottom of the bag at one cut. The testicles are then pressed out at this free opening, and the cords are separated by scraping them apart close to the body, so that when the ends are released they will be drawn into the body. It is of great importance that the hands should be clean, having been washed with carbolic soap before beginning the operation, and they should be dipped in a sterilizing solution of bi-chloride of mercury after each operation, thus avoiding probable resulting inflammation after the operation, and this is the only source of

danger. The wound is then sprayed with any sterilizing solution, or dusted with sulphate of iron finely powdered, or with common sugar, and the animal is set free in a clean floored barn for two days, until all danger of secondary inflammation may have passed. Generally it is quite safe to release the animals in a clean field, if it is not a season when flies would gather on the wounds and blow them.

At the same time when the young lambs are emasculated they should be docked, if this operation is thought necessary. It is hardly to be considered unless as a safeguard against the possible infection of the wounds by the blow flies, and when the lambs are to be fed on succulent green fodder crops, as rape or turnips, and fouling behind is to be provided for. But if to be docked, the lambs are operated on at the time of emasculating them, and in this simple manner. As they are held under the arm as above described the tail is taken by the left hand fingers, and the skin slipped up to the rump, the tail is then clipped off at the intended spot by the shears, the wound covered with powdered bluestone and the wool drawn over it.

PARASITES OF THE SHEEP.—SCAB.

It has been the experience of all shepherds, from time immemorial, that sheep were, and are, "an unhappy flock." This remark was made by one who possessed several thousand sheep, and in whose writings—consisting of poems which will never be neglected or forgotten, while the human race endures, and given to the world two thousand years ago—he simply expressed what has been the universal result of knowledge in the care of sheep. And doubtless while the causes of the numerous diseases due to attacks by parasites without, and within the sheep, were unknown, the diseases thus produced were as well known as they are to-day, that is, in regard to the effects of them, although the special causes of most of them were not understood as we now know them. What can be more emphatic than this quotation rendered from Virgil's third Georgics, in regard to a disease which is even now the bane and the constant thought of the shepherd, and which causes him untold apprehension and labor to evade: "I command that the sheep be supplied with grass (hay) in soft stables until the leafy summer is restored, and to spread the hard floor with much straw and bundles of fern under them, lest the cold ice may injure the gentle flocks and produce the scab and filthy sores." Moreover those ancient shepherds well understood the practice of smearing the sheep as a preventive or cure of this worst of all the parasites of the flock, although the true nature of it was then unknown. Indeed as late as the last century it was not known, but the best informed of the shepherds of that day thought the disease was due to "suppressed perspiration, and bad keep, dogging and exposure to cold and wet." The scab insect then was declared to be of spontaneous origin, and the existence of the pestiferous insect was never understood as we now know it.

Recent exact knowledge now goes to help us greatly in struggling with this and all other parasites of our flocks, but the evil is so widespread and virulent, and there are so many who keep sheep who will not take the pains needed to exterminate all the pests of the flock, that it is hopeless to expect full deliverance from them. And the shepherd must still be watchful, expert, and industrious, to avert the risks as far as may be possible.

These parasites are external or internal, the former are few in number, but the latter abound, and the variety of them is astounding to those who study the matter in its full bearings. Of the external enemies of this class which trouble the flock by far the worst are:

THE SCAB MITE.

These are insects of the family known as *Acari*, in which is included the common itch mite, which infests mankind. It also includes three species which affect sheep. These are known as the *Sarcoptes scabici*, which infests the head of the sheep; *Psorop-*

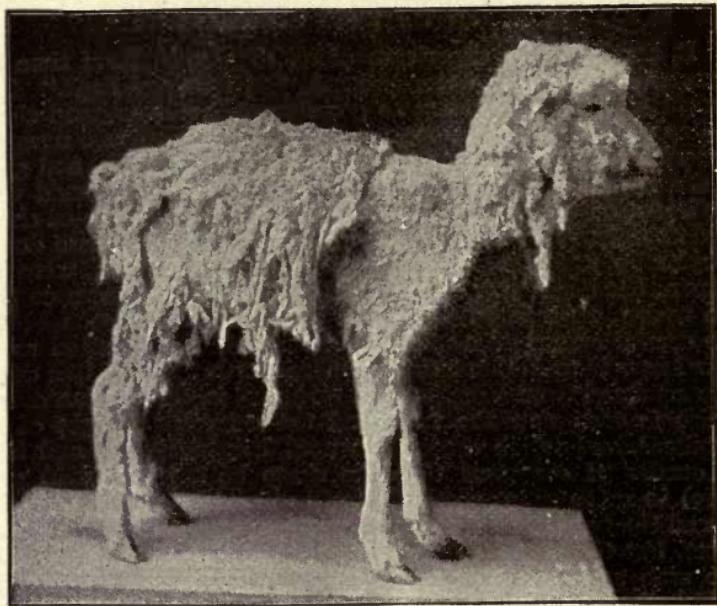


FIG. 27.—Scabby Sheep—Taken from Photograph.

tes communis, which infests the body, and *Chorioptes communis*, which affects the feet. The life history of these insects is similar in each species. They attack the skin and bite it, and these wounds so made form scabs, under which the pests lay their eggs. Each female produces an average of ten young, which mature in fifteen days, thus in the short season of three months

the progeny of a single mite may number a full million. Figures fail to convey the desperate condition of an unfortunate sheep on which only a few of these mites are existing at the outset of a Summer. The picture of a scabby sheep here given, affords some approximate idea of the condition of the animal unless relieved of the millions of these insects which are burrowing under the diseased skin, covered by these filthy sores, as described in the above quotation.

If any inquiring reader will take a piece of this dry scab from one of these sores, and lay it on a piece of white paper under a common magnifying glass, the insects may be seen moving like so much dust on the sheet. When more highly magnified the insect appears much like a spider, to which it is somewhat related, as may be seen in the engraving below which shows the mature insect.

**THE HEAD SCAB MITE—AN ADULT FEMALE.
SARCOPTES SCABICI, VARIETY OVIS.**

The head mites infest the skin of the sheep's head, beginning at the lips, near the nostrils, and eyelids and ears. From these

points they spread over the face and even down to the fore legs, under the belly and back of the knees, where the wool is short. These pests go into the long wool, or the coarse fine oily kinds, but prefer the short, dry fleece to work in.

The first indication is the rubbing of the head by the sheep, and the extent of the invasion is to be judged by the efforts of



FIG. 28.—HIGHLY MAGNIFIED.

the sheep to rid itself of its tormentors. At first there are slight elevations of the skin with soft centers, which break of themselves, and discharge a thin fluid which dries and forms hard scabs, which adhere to the skin and the hairs. In these shelters the insects feed, produce their young, and increase in number. As this increase makes it necessary these spots spread until the skin is covered with scabs, which increase in size and thickness, forming white, hard masses. In time they cover the face, lips, and forehead, and as the sheep rub themselves these scabs are broken and bleed. In time the wounds heal and scars are formed. At times the eyes are completely covered by the scabs, and the sheep becomes blind and helpless.

Infection occurs from sheep to sheep, thus spreading through the flock. There is no other way by which these insects propagate or originate, but the ordinary process of generation from parents to offspring and so on through succeeding generations. Thus the only way to find relief is to destroy the insects, thus cutting off the parents and stopping the increase. There are necessarily several ways of this infection spreading. The insects

drop from the diseased sheep on to the ground, where other sheep may lie, and others lying on the same ground, will of course become infected. They are rubbed off as the sheep scratch themselves in the vain effort to get relief, on fences, walls, and other places, and the infection easily spreads from these. As a flock passes on the road, another following will easily pick up the contagion. Sheep cars are notorious sources of infection obviously, and one scabby animal may infect thousands on a range which may follow in its track.

This form of the disease is specially different from the other two, and cannot be mistaken for either of the others. It is indispensable, considering the enormous increase in the numbers of it, that instant measures be taken for its destruction and the saving of the flock. Fortunately the location of the pest makes its first appearance so prominent that no mistake can be made in distinguishing it, and then the remedy is easy. This is to wash the parts affected in any of the dips to be procured in the market, or of any of the ointments made for this purpose, or to apply any kind of sweet thin oil rubbing it well into the scabs after washing with carbolic or tar soap, and repeating the treatment until it is certain that it has been effective.

THE COMMON SCAB MITE—*PSOROPTES COMMUNIS*.

This is the most to be feared by the shepherds of all the external parasites of the flock. It is a much larger insect than the head mite, and is visible to the unaided eye if gathered on some

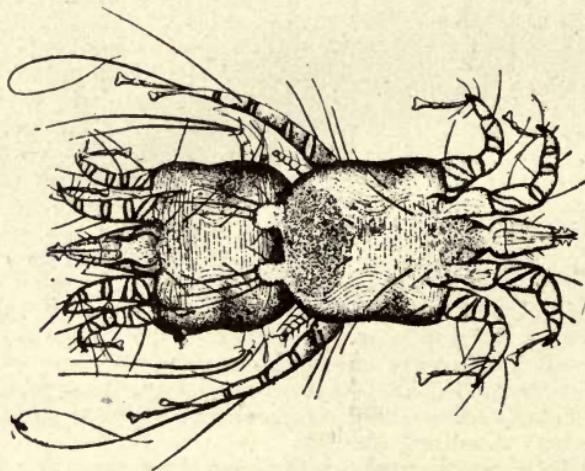


FIG. 29.—Male and Female Scab Insects.

white surface. It has been so neglected, as seems to be the rule, left for some one else to attend to, that it has gained an almost impregnable footing through the whole world. It has thus become the subject of legislation in many countries, but this as

a rule is based on the same principle, "let others do it." But if all concerned were actuated—let us say—by common sound sense, this disease might be exterminated utterly in a few years; the greatest difficulty being experienced in the first three from the beginning. After that the work would be easy and more and more effective, as the numbers of the pests became reduced. But under present circumstances, in which the rule seems to be how not to do it, the pestilence yearly becomes more and more extended, and relief fades into the uncertain distance. Thus the shepherd is under the necessity of dipping his sheep twice a year and still with only negative results.

The habits of this insect are similar to those of the previously described one. The first symptoms of its presence are that the sheep are seen to be biting themselves, apparently nibbling the wool. This of itself is bad, for the wool is apt to be swallowed and gathers in the intestines where it forms balls, which by accumulation of mucus and more wool, finally obstruct the intestines and cause trouble which is most likely to end fatally. This is one of the results of this infection which otherwise would not happen. The fleece of a scabby sheep soon becomes rough, ragged, and matted in patches, these spreading until in time they meet, when the animal exhibits the wretched appearance showed at fig. 27. At this stage of the disease, the crusts have greatly increased in thickness, and are more firmly adherent to the body. These crusts, in the same manner as some of the vegetable growths like ringworm, spread from the outer edge, and thus continually grow larger, while the centers heal, but leave the bare skin. If the inflammation has penetrated to the wool follicles of the skin, in which the fibers are rooted, these spots will remain permanently bare, rough, and unsightly.

In those places in which the fleece still exists, it is stuck together in rough masses, tangled and matted, felted in fact, and thus the sheep in its efforts to relieve itself from the intolerable irritation, tears off the wool, leaving bare spots, not as yet so far been diseased, but only as to form scabs, but yet so far as to loosen the wool. This species is most inclined to the thickest and longest wool, and hence it does the most damage to the flock owner. The disease begins on the back, spreading to the rump and down the flanks. The scabs are at first separated; as the disease spreads from the centers first infected; but in time these spots run together leaving between the active centers bare patches in thickened skin. At the edges of these patches the insects are found in the greatest numbers, and entirely cover the skin. They may there be seen moving in large clusters, and if picked up and placed on the hand their motions are easily visible. Old and young of each sex, in the act of propagating, and the eggs, may all be gathered in this way for observation by the curicus.

The disease is at its worst in the Fall and Winter. As may be thought the poorly nourished and exposed flocks suffer the most because of their want of ability to resist, and the disease will

make a slower progress as the flock is more able to resist the advances of the parasites.

“The fittest survive.” This is one of the organic laws of the universe, and in addition to all the precautions by which these pests are destroyed, as by the semi-annual dipping, and by every precaution against infection, by dipping thoroughly every exposed animal brought into a flock, we must secure exemption from this worst of all ailments of the sheep. The old sheep, too, should be dipped in time to secure the lambs against infection, and whatever sheep are found to be suffering from the parasite should be most carefully isolated until treatment can be used to disinfect them. In using any dip it will be found desirable to prepare the sheep by a previous application, by which the scabs may be softened and to break these up at the same time by some rough means, as by a bundle of corn cobs so arranged as to effect this purpose in a thorough manner. For it will be obvious that unless the crusts are broken into, so that the dip will reach the insects, much of the effect of the dipping will be thrown away uselessly. In short, in this, as in all similar operations of the shepherd, that valuable quality known as gumption is to be made use of in a thorough manner.

We prefer to say nothing as to the dips, except to guard our readers against the far too acrid sulphur-and-lime mixture, on account of its bad effect on the fleeces of sheep dipped in a precautionary manner, and as a preventive of the disease. There are so many good and safe dips in the market that it will be found best to depend on those which are made under accurate methods, as to quantities and qualities, and follow the expert advice in their application, and so avoid misuse or ineffective work, and also the certain injury to the fleece which is one sure result of this too acrid dip referred to. For it is a matter of experience that the saving of this loss will not only insure success in the work, but will pay the whole expense of it.

THE MAGGOT.

The maggot is a larvae of the common flesh fly (*sarcophaga carnaria*), the blue-bottle fly (*musca Caesar*), and the meat fly (*musca vomitoria*), all of which deposit eggs on decaying animal matter.



FIG. 30.—Maggot Fly.

These eggs or larvae are deposited in vast numbers in sores or wounds or where sheep become filthy when troubled with diarrhea. A single *Sarcophagus* sometimes contains twenty thousand eggs. The maggot attacks the skin, causing extreme irritation.

and finally a serous fluid; the skin is pierced and the flesh suppurates and wastes away, being literally eaten up by the multitudes of maggots crawling over it. Wet seasons are particularly bad for this pest. It is necessary to remove the wool from about the infected parts and apply any of the sheep dips or com-

mon crude petroleum which are repulsive and fatal to the fly and maggot. When the fly "strikes" a sheep it will often wander away, and unless found and treated will be literally eaten up. Watch the ewes at weaning time for this pest as the udder may become caked, and the fly will strike.

THE SHEEP LOUSE—TRICHODECTES SPAHAEROCEPHALUS.

The mere exposure of sheep to any disturbing influence is disastrous. Thus the louse, by which the sheep is annoyed, is sufficiently worth notice in this regard to cause the shepherd to take the due precautions to secure the sheep from the annoyance of it.

The red-headed Sheep Louse (*Trichodectes Sphaerocephalus*) was almost unknown in this country until recent years. It is now



FIG. 31.
Eggs on Wool Fibers.



FIG. 32.
Sheep Louise; Highly Magnified.

becoming very abundant in some sections, and the damage it does to young lambs and sheep is of sufficient importance to engage the attention of every flockmaster.

The true sheep louse rarely exceeds one-twenty-fifth of an inch in length. The female is slightly longer and larger than the male. Its head occupies about one-fourth its length and is of a pale reddish color. The adults lay their eggs at the base of the wool fibers and a glutinous substance sticks them there. The lice are generally found on the bare spots between the legs and body, just under the shoulder. In young lambs and open-wool sheep they may frequently be found in large numbers on the back of the neck.

The injury wrought by these parasites is very considerable. They live on the blood of the host, and in biting through the skin they cause an intense itching sensation and leave a wound. They give great discomfort to the sheep and the wool becomes gnarly and worthless wherever these pests attack the skin.

In New Zealand dipping for these parasites has been made compulsory by the government. Sheep lice rarely ever attack the fine wool or Merino sheep. One dipping in any standard dip, will be sufficient to not only kill the live lice, but also destroy all the eggs of these parasites.

THE SHEEP TICK—*MELOPHAGUS OVINUS*.

Some writers on sheep and their numerous troubles, have said that this insect seldom causes much damage to the sheep in any way. Experienced shepherds will differ in this. They are well

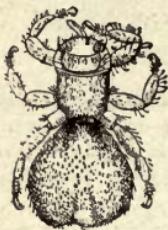


FIG. 33.

aware that this insect does very serious injury to the sheep as being both the direct and indirect cause of not only inconvenience, but disturbance of the health and prosperity of both the sheep and the lambs. They interfere with the growth of the lambs by crowding on to them as soon as the ewes are shorn, and then begins a mostly unsuspected drainage of the life blood of

the hope of the flock, as the ancient writer well called, the lambs. The lambs, suffering seriously from these blood suckers, one hundred of which on a lamb will easily drain it dry of blood in a few days, cannot prosper, and soon become emaciated and weak, and never after recover the loss of vitality thus inflicted on them.

This insect is a degraded fly in every sense of the word, having no wings, but six legs only. The species differs from the true ticks, which belong to the spider family, while the sheep tick is a member of the diptera or two-winged insects, which have only six legs, the spider families having eight legs. Like many other flies, as the deer fly, the horse fly, and the mosquito, the sheep tick is a blood sucker and an exceedingly hungry one. Sixty drops are the usual measure of one liquid ounce, and an inch tick will easily draw several drops of blood from a lamb in twenty-four hours, always having its pump in operation, day and night, and it is by no means rare that a hundred of these pests may feed on one lamb, it is easy to figure out the problem, how long will so many ticks drain a lamb dry of blood.

When the ewes are shorn, the ticks migrate immediately on to the lambs, burying themselves in the thick, short wool and immediately begin active business. This serious view of the case of the ticks against the sheep, is not sufficiently considered; and it should be made a practice when the sheep are shorn, to proceed at once to dip the lambs and so relieve them of these persecutors for good and all, and of course save the sheep in the future. As to this, the tick should be classed next to the seab mite, and treated accordingly.

This fly has a unique interest to the scientific student, inasmuch as it brings forth its young, not in the form of eggs or living larvae, but in an advanced stage as pupae. These are the almost round, red bodies, seen attached to the wool on ticky animals. They are to be got rid of most industriously. The author has had experience in clearing the lambs and sheep both in a

unique way probably. This is by keeping a flock of fowls in the sheepyard at the lambing season, and indeed at all times. Feeding them when the sheep are fed, for the mere purpose of observing how they will most industriously pick the ticks out of the wool of both ewes and lambs. This the fowls do most effectively in the warm days when the ticks come to the surface of the fleece to cool themselves and get the fresh air. These insects cannot live apart from the sheep over a few days, and thus their voracity is well accounted for. It is not only the loss of blood that weakens the sheep and much more the lambs, but the intolerable pain caused by their bites. Like the mosquito they inject into the wounds they make some poison, which liquidates the blood, and this produces a more annoying irritation than the mosquito does. The poison causes swelling of the skin, which lasts—as Dr. Curtis states in his work on the Animal Parasites of the Sheep—for over a week, and is accompanied by a worse itching than that of mosquito bites. Those concerned who have experienced the severe pain of the bites of the mosquito, will surely sympathize with the sheep, "always an unhappy flock," according to the old writer, and all modern experience.

Treatment for this parasite consists mostly of dipping, in the same way, and at the same time, as for the scab. Indeed, it is the best way to dip the flock expressly for this purpose at the shearing time, which is also advisable—indeed it may be said indispensable—as a means of avoiding infection by the scab, or curing insipient infection already accomplished, by exposure to the disease. Thus we accomplish two valuable ends at one operation. The ticks that remain in the wool wrapped in the folded fleeces will starve in a few days. If this operation is neglected, the seed will be sown for the coming years the next Summer.

PROMINENT SYMPTOMS OF COMMON DISEASES.

Appetite, Depraved, Ravenous.—Worms in the intestines. Indigestion.

- Want of.—Over feeding. Any serious disorders of the system.

Biting the hind legs.—Myelitis.

Bleating.—Indigestion. Impaction of the rumen (the first stomach).

Bowels, Constipated.—Impaction of the fourth or the third stomach. Rheumatism. Indigestion.

Looseness of.—Disease of the liver. Fluke diseases. Chronic Indigestion. Intestinal worms.

Breathing, Rapid.—Anthrax. With dry, hot mouth, fevers.

Gasping.—Impaction of stomach.

Long and short alternately. Inflammation of the lungs. Pleurisy. Pleuro-pneumonia.

Rattling and loose. Pleuro-pneumonia.

Cough, Frequent and short.—Indigestion. Catarrh.

Husky.—Thread worms in the throat.

Deep and rattling.—Bronchitis. Pleurisy.

Discharge, from Nose.—Thin. Catarrh. Bronchitis (changing to thick and dry, about the nostrils.) Grubs in the head. (Mixed with blood.) Influenza (greenish or creamy).

From the vulva.—White, thin, Leucorrhea (inflammation of the womb). Yellowish, purulent, approach of abortion.

From the eyes.—Ophthalmia. Injury by stubble, or alkaline dust on the range. From the penis of rams. Gonorhea. Gleet. (This is contagious to the ewes.)

Eyes.—Cloudiness.—Inflammation of cornea. Bluish film. Ophthalmia.

Redness.—Inflammation of the interior of the eye.

Thick film over cornea.—Cataract.

Redness, with weeping.—Anthrax. (Black leg or black quarter). One of the first symptoms.

Weeping.—Catarrh. Injury to chaff or alkaline dust.

Fleece, Harsh, dry.—Disease of the liver. Worms in intestines.

Loosening.—Congestion of skin. Indigestion. Result of a general low condition.

Giddiness.—Disease of the brain. Impaction of the stomach. With turning around. Cysts of tapeworm (*Tenia Coenurus*) in the brain. This disorder is often called Gid.

Head held up.—Tapeworm cysts in the brain. Myelitis.

Jaws, swelling under.—Soft, watery. Disease of the liver. Flukes. Tape worms.

Harder.—Disease of the thyroid gland (Goitre). General weakness of the system and impoverished blood. Dropsy. General low condition.

Lameness.—Going on the knees.—Foot rot. Sore feet.
In the hind limbs.—Paralysis, due to brain disease.

Leaping motions.—Louping ill. Myelitis. Congestion of the brain.

Lips sore.—Aphtha, injury by stubble pasturing. Fevers. Effects of Porcupine grass. (*Stipa Spartea.*) Fevers.

Loco.—Insanity from eating crazy weed (*Astragalus Mollismus* or *Oxytropis Lamberti*).

Liver, spotted.—Congestion. Inflammation. Flukes and other worms, in gall bladder and ducts.

Milt, soft, black and swollen.—Anthrax. Splenic fever.

Moving in circles or straight ahead with head up.—Cysts of the bladder—tape worm (*Coenurus cerebralis*).

Neck stiff.—Myelitis. Rheumatism.

Paralysis.—Disease of the brain. Myelitis. Injury to spinal cord. Loco weeds. Ergot from smutty grass, corn fodder, or grain. Indigestion. Exposure to cold rain. In young lambs inherited.

Pawing.—Indigestion. Impaction of stomach.

Scours, white in lambs.—Indigestion. Effects of diseases of the bowels or liver in ewes.

Shivering.—Fevers. Anthrax. Splenic fever.

Skin, Pale.—Thread worms in throat.

Red.—Congestion. First indication of scab.

Yellow.—Disease of liver. Fluke disease. Disease of liver by tape worms.

Slobbering.—Indigestion. Sore mouth. Diseased teeth. Poisoning by laurel or loco weeds.

Sneezing.—Grubs in head. Influenza: Catarrh.

Snorting.—Grub in head.

Spasmodic motions.—Meningitis. Hydatids in brain.

Stiffness of limbs and neck.—Rheumatism. Myelitis.

Staggering.—Inflammation of the brain. Poisoning by laurel and loco weeds. Cysts of tape worms in the brain.

Stomach bloated.—Hoven or bloating. Indigestion. Poisoning.

Stupor.—Disease of brain—the last and hopeless stage. Epizootic influenza. Last stage of diseases of the lungs and pleuro-pneumonia.

Teeth grating.—Indigestion. Fluke disease. Poisoning.

Throat glands swollen.—Dropsy. Disease of the thyroid gland, especially prevalent in lambs.

Soft swelling.—Liver disease. Dropsy. Tape and other worms producing general debility. Fluke disease.

Trembling.—Disease of the brain. Myelitis. Poisoning, especially by laurel.

Urine, red.—Disease of the bladder, by gravel or stone, or inflammation.

Disease of the liver a result of indigestion.

Disease of the kidneys.

Dark red.—Anthrax. Splenic fever.

Vulva, red.—Indication of heat in ewes.

Red and swollen.—Premonitory of abortion.

Wool, falling.—Scab. Congestion of the skin. Low condition of the system.

Harsh and dry.—Disease of the skin. Fevers.

Biting of, by sheep.—Ticks, lice, irritation of skin by indigestion. Effects of various worms.

It is not a safe way to treat a sheep from any one of these symptoms alone. There are several of them associated with every disease mentioned. It is therefore indispensable that every indication is to be carefully noted, and when the several symptoms agree together the disease may then be safely diagnosed, and treated accordingly. The prognosis of any disease—that is, the expectation of its course and end—may be gathered from the urgency of the various symptoms and the association of them in each special case. It is to be always considered that sheep are the lowest organized of all the domestic animals. This is doubtless due to the fact that from the very first association of this animal with mankind, and its consequent dependence on the shepherd for its safety and care, it has become so weakened in constitution as to be the least of all the domesticated animals to resist misfortune. And hence the most watchful care of the shepherd is called for to avoid misfortune, and to watch carefully for the first indication of it, and then treat without delay and while treatment may be effective.

LIST OF REMEDIES AND USES, SPECIALLY FOR SHEEP.

Aconite, Tincture of.—Sedative for inflammations. Sheep 3 to 5 drops.

Ammonia, Carbonate.—Stimulant, anti-spasmodic, indigestion. $\frac{1}{2}$ to 1 dram.

Areca nut, vermifuge.—For worms in dogs. $\frac{1}{2}$ to 1 dram.

Belladonna, extract.—Anti-spasmodic. For spasmodic affections. Myelitis. Paraplegia. $\frac{1}{2}$ dram.

Bismuth, sub-nitrate.—Soothes irritation of stomach. Catarrh.

Bromide Potassium.—Nerve sedative. Myelitis. Inflammation of brain. $\frac{1}{2}$ dram.

Camphor.—Sedative.—Anti-spasmodic. Myelitis. Impaction of stomach. Diarrhea. Dysentery. 1 scruple.

Castor oil.—Purgative.—Worms. 3 to 4 ounces.

Copper sulphate.—Astringent. Wounds, sores, cuts. In solution or powder.

Digitalis.—Dandelion extract.—Diuretic. Sedative. Fevers. 10 grains.

Gentian.—Tonic. Want of appetite. Weakness. Worms. 1 to 2 drams.

Ginger.—Stimulant. Tonic. Indigestion. (With gentian) $\frac{1}{2}$ ounce.

Iodine.—Alterative. Diuretic. Diseases of kidneys.

Iodide of Potassium.—Alterative. Diuretic. 3 scruples.

Iron sulphate.—Astringent. Tonic. Checks bleeding. Wounds. Indigestion. With gentian.

Laudanum.—Sedative. Anti-spasmodic. Myelitis. 2 drams.
Linseed oil.—Purgative. $\frac{1}{2}$ pint. Checks dysentery. 2 ounces.
Magnesia sulphate.—Epsom salts.—Purgative. Cooling. Indigestion. Fevers. Constipation. 4 ounces. For diarrhea $\frac{1}{2}$ dose.
Nux vomica.—Nerve stimulant. Hydro-Rachitis. Myelitis. Paralysis. 5 to 10 grains.
Podophyllin.—Mandrake.—Purgative. Disorders of liver. 15 grains.
Potassa chloride.—Stimulant. Anti-septic. Cooling. Fevers. Black leg. 30 grains.
Soda chloride.—Salt.—Tonic. Vermifuge. Indigestion. $\frac{1}{2}$ ounce.
Soda, Hyposulphite.—Alterative. Disinfectant. Black leg. 4 drams.
Santonine.—Vermifuge. Stomach worms. 2 to 4 drams.
Spanish fly.—Cantharides.—Stimulant. Diuretic. Stimulant for ewes in season. 1 to 2 grains.
Sulphur.—Promotes perspiration. Laxative. 1 to 2 ounces.
Tar.—Anti-septic. Tonic. For wounds. $\frac{1}{2}$ ounce.
Turpentine.—Anti-spasmodic. Diuretic. Myelitis. Bloating. Colds. 1 to 2 drams.
Turpentine.—Vermifuge. Stomach, lung and other worms. 4 drams.

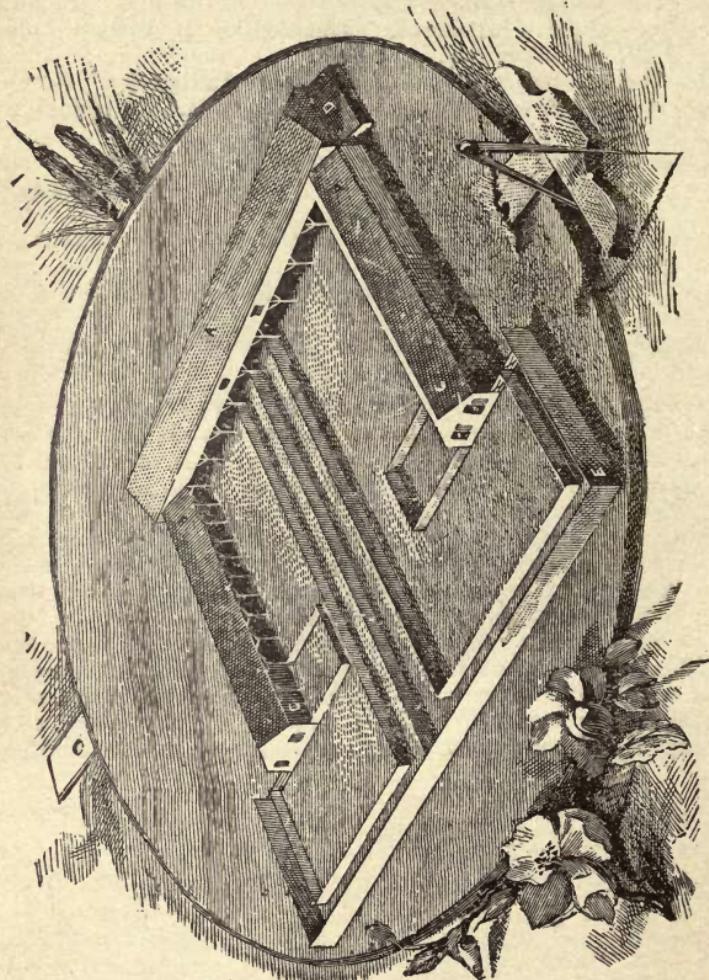
It is to be carefully noted that the sheep is the lowest organized of all domestic animals as to its nervous system. No other animal so soon submits to misfortune and fails to rally from a depressed condition. It is therefore necessary to study carefully the various symptoms present in any case of disease, and consider whether a sedative or stimulant is called for. The latter is required when great weakness and prostration call for it, and in cases in which, otherwise sedatives are injurious. Generally treatment is needed at intervals of six hours, to be repeated if not then effective. For lambs from 6 months to a year old the doses should be reduced to one-half those required by a full grown sheep. Sedatives allay and lessen excitement, in which the action of the nervous system is excessive. This class of remedies depress, stimulants excite, nervous action. Tonics strengthen the vital functions.

ERRATA.

Page 78, fifteenth line from bottom, read *hardy* for *hairy*.
124, fourth line from bottom, read *only* for *easy*.
174, second line from bottom, read *fed 19 lbs.*

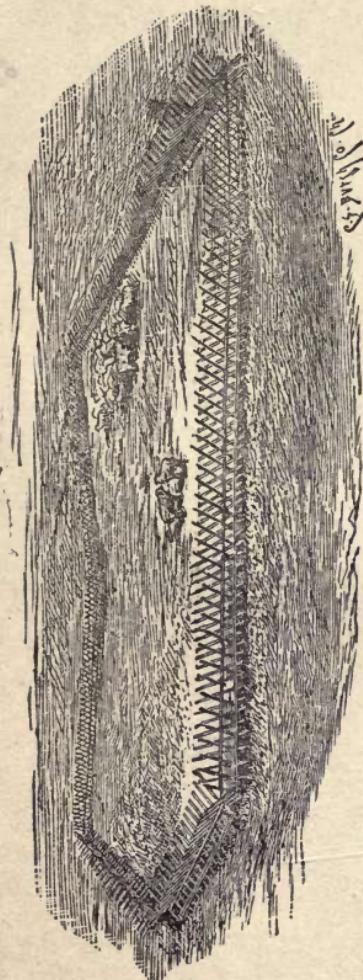
PLAN OF SHEEP BARN, YARDS AND SHEDS,
ADAPTED TO THE SOUTH.

Our illustration pictures a range of buildings and yards well adapted to the climate of the South for sheltering and feeding large flocks of sheep. The main barn, A, is



drawn to scale representing it one hundred and fifty feet long and twenty-five wide. The posts are sixteen feet high, giving ample space above the basement shed for the storage of fodder. At the end of this barn, cellars, D, are constructed for the storage of roots. The sheds, B B, are

one hundred feet long and have only eight foot posts, with no storage room above. At the ends of these sheds are hospitals, C C, with yards indicated by the amine teeth, bre ak scab, brand, etc.; 2,000 is a usual day's light lines in front. The outside fence, E E, is made very high and strong to withstand heavy winds, and boarded tight. An evergreen screen should be planted on the outside of this. The interior fences are of light paling, and are intended merely to divide the flocks.



Water troughs are placed in the line of interior fences, so as to be accessible from all the yards. There are four yards in the enclosure besides those attached to the hospitals, and by opening a twelve foot gate at the entrance a flock may be directed into any one. An establishment of these dimensions is supposed to be sufficient to accommodate a flock of twelve hundred, in a mild climate, and can be constructed at a comparatively small cost.

CANADIAN SHEEPFOLD.

Our illustration shows a convenient and easily constructed sheepfold, suitable for small flocks. It is in use in Canada and the construction can readily be seen by reference to the engraving. The hurdles are of white pine 4x4 and $1\frac{1}{2} \times 1\frac{1}{2}$ inches. The rape which the sheep fed off (3 $\frac{1}{2}$ acres) kept thirty-five sheep seven weeks, with a pint of oats per head per diem.

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